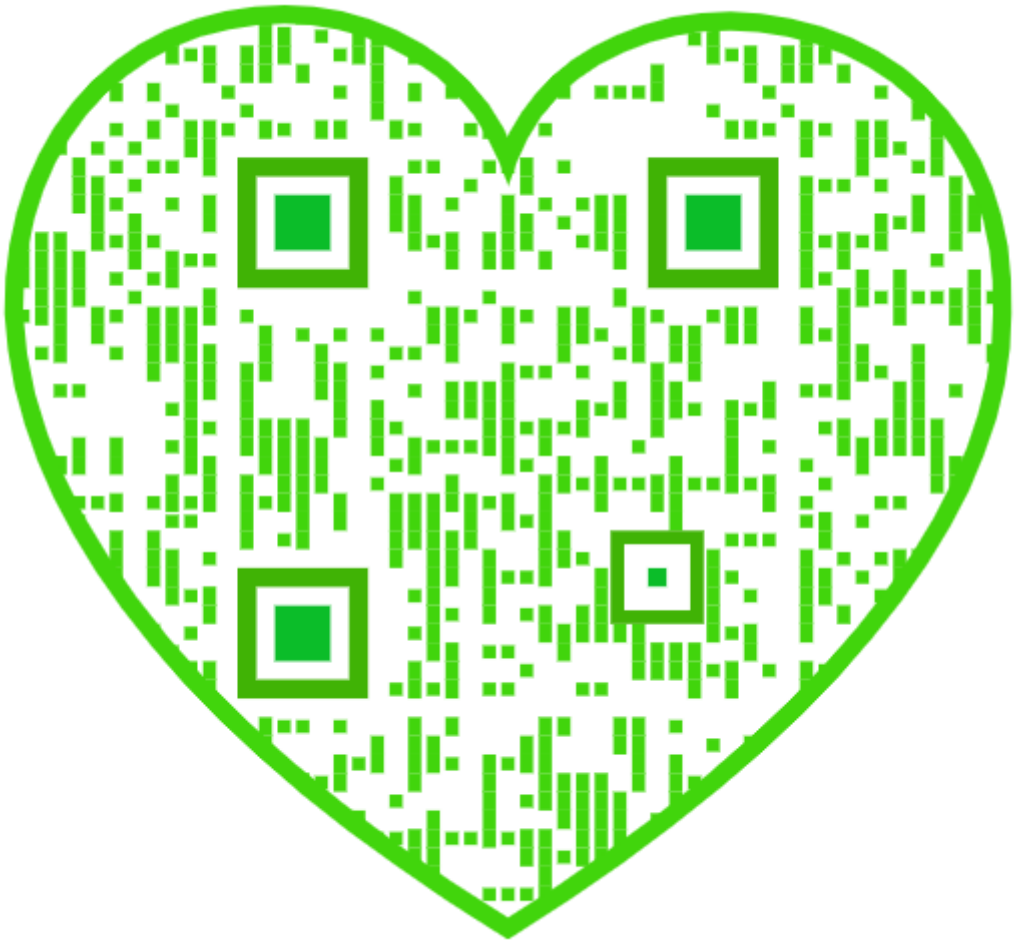
ARITHMETIC

YOUNG & JACKSON

BOOK ONE

D. APPLETON & COMPANY



THE APPLETON SCHOOL BOOKS

ARITHMETIC

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BOOK I

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BOOK I

REVIEW AND PREPARATION

1. Count the figures on this page.

2. Which figure is a straight line? Which is a square? A triangle? A rectangle? A circle? A cube?

Figure A

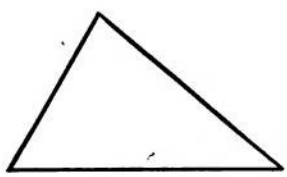


Figure B

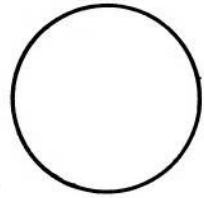


Figure C

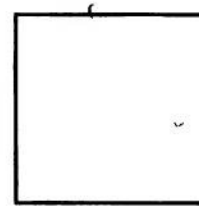


Figure D

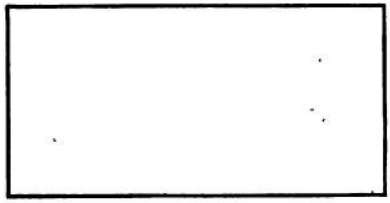


Figure E

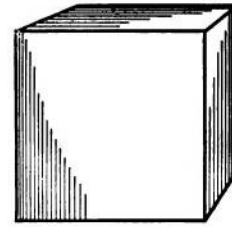


Figure F

3. How many sides has a triangle? A square? A rectangle?

4. How do the sides of the square compare in length? Are all of the sides of the rectangle equal?

Material: Inch cubes

1. Count the steps in the picture that Mary will take to reach the top of the steps.

2. Place a cube on your desk for the first step. How many more will you need to make the second step?

3. Build the second step. How many cubes are used to build the two steps?

4. How many cubes are needed to make the third step?

5. Build the third step. How many cubes are used to build the three steps? How many cubes are used to build the second and third steps?

6. How many cubes are needed to build the fourth step?

7. Build the fourth step. How many cubes are used to build the four steps? The third and fourth?

1. How many more cubes are needed for the eighth step than for the fourth?

2. How many more than for the 5th? The 2d?

3. How many more are used for the fourth than for the second?

4. How many more for the 6th than for the 4th?

5. How many more for the 6th than for the 3d?

6. For the ninth than for the sixth? For the eighth than for the sixth?

7. How many more steps are left when Mary has climbed half the steps?

8. How many steps has Mary taken when she has climbed half of the first four?

9. When she has climbed half of the first six? Half of the first eight?

10. As she goes up the steps, on how many will she put her right foot? Her left foot?

11. If a boy runs up the steps, touching every other one, how many will he touch?

12. When the first 3 steps are painted, how many remain unpainted?

13. When the next 3 are painted, how many remain unpainted?

14. When 2 of the 10 steps are broken and half of the rest are marred, how many are marred?

15. If each cube costs 1 cent, what is the cost of the first step?

16. What is the cost of the cubes in the first two steps? In the first three? In the first four?

Material: A dozen inch cubes

1. Build a set of four steps with the cubes.

2. How many cubes have you used? How many are left out of the dozen?

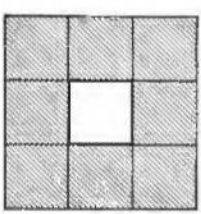
3. How many more cubes will be needed to build a set of 5 steps than a set of 4 steps?

4. With 12 cubes build a straight wall 2 cubes high. How many cubes are there in each row?

5. How many sets of 6 cubes in 12 cubes?

6. Make a wall 3 cubes high. How many sets of 4 cubes in 12 cubes? How many sets of 3 cubes?

7. Draw a 1-inch square. Make a wall of cubes 1 inch high around the square. How many cubes are there in the wall?



The shaded part of the picture shows how to place the cubes.

8. With 12 cubes build a wall so as to enclose a square. How many cubes are there on a side?

9. The inside square is — inches on a side.

10. How many inches in the distance around the square? Around the outside of the cubes?

A square whose sides are each 2 inches long is called a **2-inch square.**

11. With inch cubes build a cube 2 inches on an edge. How many cubes are needed?

12. Show that 8 cubes are the same as 4 times 2 cubes or 2 times 4 cubes.

13. Build the letter **T** with cubes; the letter **H**; the letter **E**. How many cubes have you used for each?

Answer the questions on this page without measuring the objects:

1. Are you taller or shorter than the door?

2. Which is longer, the door or the window?

3. Which is wider, the sidewalk or the street?

4. Which is higher, the top of the window or the top of the door?

5. Compare the width of a window-pane with its length.

6. Compare the width of the room with its length.

7. Compare the width of your arithmetic with its length.

8. Name an object that is longer than it is wide, and wider than it is thick.

9. Which is farther from the floor, the bottom of the blackboard or the bottom of the window?

10. Compare the length of your book with the length of your pencil.

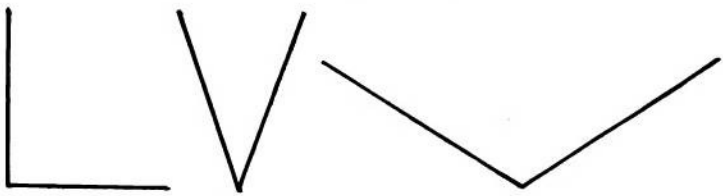
11. Which is farther from your desk, the door or the window?

12. Which is farther from your house, the schoolhouse or the railroad station?

13. Which travels faster, a street-car or an express-train?

14. Which travels faster, an automobile or an express-train? A steamboat or a rowboat?

15. Compare the length of the school ground with its width. Compare the width of the school ground with the width of the street.



1. In which figure is the opening between the lines the greatest? The least?

2. Draw from a point two lines that have an opening like that between the lines in the first figure.

3. Draw two lines that have an opening like that between the lines in the second figure.

4. Do the same for the third figure.

5. Draw from a point two lines that form an opening smaller than any of these; larger.

6. Open your book part way. Make a different opening; a still different one.

7. Set your book on end and open it so as to make an opening smaller than the corner of the room.

8. Make one larger than the corner; equal to it.

9. Arrange several objects in order of thickness.

10. Name several surfaces in order of size.

11. Name several objects in order of length.

12. Point out the shortest line of print on this page.

13. Which exercise has the most words? In how many exercises did you have to count the words?

Material: Foot rules marked in inches only. Make from paper if necessary

1. Count the number of spaces on the rule.

2. What is each space called? How many inches are there in a foot?

12 inches make 1 foot. (12 in. make 1 ft.)

3. Find the middle of the rule. How many spaces is this point from each end?

4. How many inches in one-half of a foot?

5. Is your book 1 foot wide when open? Is it more or less than 6 inches wide?

6. Is your book more or less than 6 inches long?

7. Find a point on the rule that is 3 inches from one end. Find a point 3 inches from that.

8. Find one 3 inches from that; 3 inches from that.

9. How many 3-inch spaces in 1 foot? 4 times 3 inches are how many inches?

10. In the same way find how many 4-inch spaces there are in a foot. 3 times 4 inches are —.

11. How many inches are there in one-half of 1 foot? In one-fourth? In one-third?

12. Draw a line 1 ft. long; 6 in. long; 3 in. long; 4 in. long.

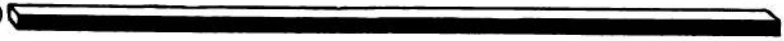
13. Draw a line 6 in. long; continue it 2 in. more; then 4 in. more. How long is the whole line?

14. Make two marks 1 ft. apart as nearly as you can judge; in the same way make others $1\frac{1}{2}$ ft. apart;

1 in. apart	6 in. apart
2 ft. apart	3 ft. apart.

15. Test your estimates in Exc. 14 by measuring.

1. Which of these bars is the longest? The shortest?

(1) 

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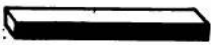
(3) 

(4)

2. Which is the shorter, the third bar or the fourth?

3. Which is the longer, the second bar or the fourth?

4. If the third bar is 1 inch long, how long is the fourth bar?

5. If the fourth bar is 2 inches long, how long is the second bar?

6. If the fourth bar is 2 inches long, how long is the first bar?

7. The first bar is how many times as long as the fourth bar?

8. The length of the fourth bar is what part of the length of the first bar?

9. The first bar is how many times as long as the third bar?

10. Draw a line 8 inches long. Mark off $\frac{1}{2}$ of it. $\frac{1}{2}$ of 8 inches is how many inches?

11. With the aid of a rule draw a line 6 inches long. Draw another one-half as long as the first; $\frac{1}{3}$ as long.

Oral. Read and supply the proper number words:

1.	1 and 2 are —.	1 and 3 are —.	1 and 4 are —.
2.	1 and 9 are —.	1 and 7 are —.	1 and 8 are —.
3.	1 and 6 are —.	1 and 5 are —.	9 and 1 are —.
4.	2 and 1 are —.	2 and 3 are —.	2 and 2 are —.
5.	2 and 4 are —.	2 and 6 are —.	2 and 8 are —.
6.	2 and 5 are —.	2 and 7 are —.	8 and 2 are —.
7.	3 and 1 are —.	3 and 3 are —.	3 and 5 are —.
8.	3 and 2 are —.	3 and 4 are —.	3 and 6 are —.
9.	3 and 7 are —.	6 and 3 are —.	7 and 3 are —.
10.	4 and 1 are —.	4 and 4 are —.	4 and 3 are —.
11.	4 and 2 are —.	4 and 5 are —.	4 and 6 are —.
12.	5 and 1 are —.	5 and 4 are —.	5 and 5 are —.
13.	5 and 3 are —.	5 and 2 are —.	8 and 1 are —.
14.	7 and 1 are —.	7 and 2 are —.	6 and 2 are —.
15.	6 and 4 are —.	6 and 1 are —.	1 and 1 are —.
16.	1 and — are 3.	2 and — are 3.	1 and — are 5.
17.	3 and — are 4.	2 and — are 4.	4 and — are 5.
18.	3 and — are 5.	3 and — are 6.	5 and — are 6.
19.	4 and — are 6.	3 and — are 7.	2 and — are 7.
20.	1 and — are 7.	6 and — are 7.	4 and — are 7.
21.	5 and — are 7.	3 and — are 8.	1 and — are 8.
22.	2 and — are 8.	6 and — are 8.	4 and — are 8.
23.	2 and — are 6.	7 and — are 8.	8 and — are 9.
24.	3 and — are 9.	2 and — are 9.	6 and — are 9.
25.	4 and — are 9.	1 and — are 9.	5 and — are 9.

Oral.

1. How many steps will the boy take in crossing the street?

2. How many steps will the boy take to reach the middle of the street? How many tens are there in 20?

3. How many steps will the postman take in crossing the street? How many twos are there in 20?

4. How many of the postman's steps will make 8 of the boy's? How many twos are there in 8?

5. How many of the postman's steps will make 12 of the boy's? How many twos are there in 12?

6. Show from the picture the number of twos in 14; in 16; in 20; in 18.

7. How many steps has the boy taken when he is half-way across the street? 10 is what part of 20?

8. How many steps has the boy taken when he is half-way to the middle of the street?

9. How many times must the boy take 5 steps to cross the street? How many fives are there in 20?

Oral.

1. How many steps of the distance are left when 7 steps and then 8 steps have been taken?

2. How many steps are left when 8 steps and then 9 steps have been taken?

3. How many steps are left when 7 steps and then 6 steps have been taken? 12 steps and then 5 steps? 6 steps and then 9 steps? 8 steps and then 8 steps? 13 steps and then 6 steps?

4. When the boy is 6 steps from the telephone-pole, how many steps is he from the cross-walk?

5. When he is 7 steps from the cross-walk, how many steps is he from the telephone-pole? 9 steps from the cross-walk? 15 steps? 11 steps? 13 steps?

6. 4 of the postman's steps are equal to how many of the boy's?

7. 7 of the postman's steps are equal to how many of the boy's?

8. 6 of the boy's steps are equal to how many of the postman's?

9. 10 of the boy's steps are equal to how many of the postman's?

10. Add:

2	4	8	4	2
2	2	2	4	6

11. Count by 2s to 20; thus: "2, 4, 6, —"

12. In 12 there are — 2s. In 10 there are — 2s.

13. In 20 there are — 2s. In 16 there are — 2s.

14. 4 of the postman's steps and 5 of the boy's are together equal to how many of the boy's?

Material: 20 1-in. sticks and 20 2-in. sticks; also rectangular pieces of paper 4 inches by 2 inches, or sheets of paper on which rectangles of this size are drawn

1. The rectangle is a yard to be fenced. Fence it with short sticks end to end. How many are used?

2. With short sticks divide the yard the long way into two equal lots. Each lot is — of the yard.

3. How many sticks are there in the cross-fence? In all the fences? Remove the cross-fence.

4. With short sticks fence the yard the short way into two equal lots. Each lot is — of the yard.

5. How many sticks were needed for the cross-fence? How many were used in all?

6. Rebuild the first cross-fence. Into how many equal parts is the yard divided by both fences?

7. Each lot is what part of the whole yard? Two of these are what part of the whole yard?

8. Fence the same field with 2-inch sticks. How many does it take?

9. What is the distance around the whole yard?

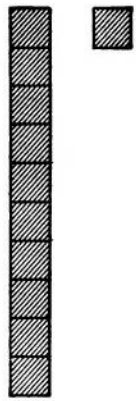
10. If there are 3 rabbits in each lot, how many rabbits are there in the yard?

11. Draw a 4-inch square; fence it with 1-inch sticks. How many sticks on each side? In the whole fence?

12. Fence the same square with 2-inch sticks. How many are used?

13. The number of 2-inch sticks is what part of the number of 1-inch sticks?

Material: 20 1-inch squares



1. Build 11 squares as in the picture.

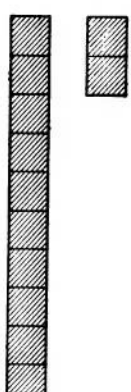
2. How many squares are there in all? 10 and 1 are —. 10 and — are 11. 1 and — are 11.

3. Take 9 squares in a column. Add enough squares to build 11 as before.

9 and 2 are —. 9 and — are 11. 2 and — are 11.

4. Take 8 squares in a column. Add enough squares to build 11. 8 and 3 are —. 8 and — are 11. 3 and — are 11.

5. Answer in the same way: 6 and — are 11. 5 and — are 11. 7 and — are 11. 4 and — are 11.



6. Build 12 as in the picture.

10 and 2 are —. 10 and — are 12. 2 and — are 12.

7. Take 9 squares in a column. Add enough to build 12 as before.

9 and 3 are —. 9 and — are 12. 3 and — are 12.

8. Answer in the same way: 4 and — are 12. 6 and — are 12. 5 and — are 12. 8 and — are 12. 11 and — are 12.

9. 9 and — are 13. 6 and — are 13. 5 and — are 13. 7 and — are 13. 4 and — are 13. 3 and — are 13. 8 and — are 13.

10. 10 and — are 14. 5 and — are 14. 8 and — are 15. 7 and — are 19. 10 and — are 20.

1. How many boys are ten boys and 1 boy? Eleven are how many more than ten? How many tens are there in eleven and how many ones besides?

2. How many girls are ten girls and two girls? Twelve are how many more than ten? How many tens are there in twelve and how many ones besides?

○○○○○○○○○○ ○○○

3. Ten circles and three circles are how many circles? How many tens are there in thirteen and how many ones besides?

4. 5 squares and — squares are 5 squares.

The symbol for none is *0*. It is called **zero** or **naught.**

5. In 11 which figure shows the number of tens? What does the other figure show? In 12? 10? 20?

3 feet make 1 yard. (3 ft. make 1 yd.)

1. Draw a line a yard long; another a foot long.

2. What part of the first line is the second?

3. Draw a 2-foot line and mark it off into 6-inch spaces. How many are there?

4. How many 6-inch spaces are there in 24 inches? 4 times 6 inches are — inches.

5. Mark a line 1 yard long into 6-inch spaces. How many are there?

6. Two of them are what part of the line? 3 of them?

7. Find some object that is 2 feet long; 3 feet long; 1 foot and 6 inches long.

8. Is the height of your desk more or less than 2 feet? How many feet are there in its breadth?

9. How many feet and inches are there in its breadth?

10. Draw a line on the blackboard 1 yd. long; 2 ft. long; 4 ft. long; 1 ft. 6 in. long; $4\frac{1}{2}$ ft. long.

11. Draw a line on paper for each line named in Exc. 10, using 1 in. on paper for 1 ft. on the board.

12. How many yards long is your school-room? How many yards wide? (Omit parts of a yard.)

13. Make a picture of the school-room floor, using 4 in. in the picture for 1 yd. on the floor.

14. Measure in yards the length of the blackboard on one side of the room; take its width as 1 yd.

15. Draw a picture the shape of the blackboard, using 1 in. to represent 1 yd.

Read and fill blanks:

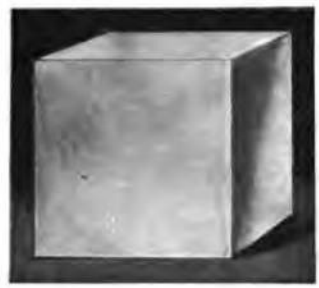
1. $\frac{1}{2}$ of 8 equals —. $\frac{1}{2}$ of 12 equals —.
2. $\frac{1}{3}$ of 9 equals —. $\frac{1}{3}$ of 12 equals —.
3. $\frac{1}{4}$ of 8 equals —. $\frac{1}{4}$ of 12 equals —.
4. Count by 2s to 20. 20 equals — 2s.
5. How many 1-inch cubes are needed to build a cube 2 inches on an edge?
6. How many inches are there in a foot? How many 6-inch lengths are there in a foot? How many 3-inch lengths are there in a foot? How many 4-inch lengths?
7. How many tens and how many ones besides are there in 17? In 13? In 11? In 12? In 18? In 20?
8. How many feet in a yard? In $\frac{1}{3}$ of a yard? In $\frac{2}{3}$ of a yard?
9. How many inches are there in $\frac{1}{3}$ of a yard?
10. Draw a picture the shape of the window-frame, using 1 inch in the picture for 1 foot of length or breadth in the actual window.

Add:

11. 3	12. 4	13. 5	14. 9	15. 7	16. 5
2	3	6	2	3	5
17. 6	18. 8	19. 5	20. 7	21. 9	22. 9
7	9	7	7	6	9

23. 10 and — are 15. 6 and — are 15. 8 and — are 15. 9 and — are 15. 7 and — are 15.
24. What number added to 10 makes 16? What number added to 6 makes 16? To 9? To 12? To 8?

Material: A 1-inch cube



1. What kind of a figure is any face of a cube?

2. Count the faces on a 1-inch cube.

3. Count the edges on a 1-inch cube.

4. How many edges has any face?

5. If the four edges of a face were placed end to end in a straight line, what would be the length of the line?

6. If all of the edges of the cube were placed in a straight line, what would be the length of the line?

7. The distance around one face of the cube is what part of the sum of all the edges?

8. How do the faces of the cube compare in size?

9. One face is what part of the surface of the cube? Two faces? Three faces? Four faces?

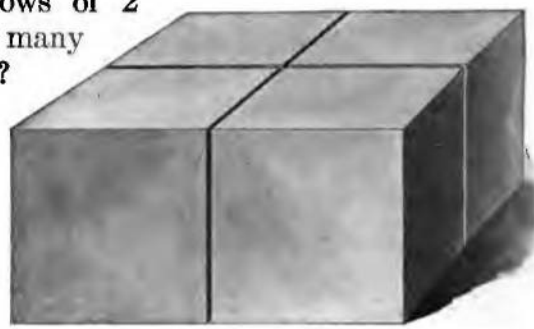
10. Tie a string around the middle of the cube. How many edges does it touch? How long is the string, not allowing for the knot?

11. Tie a string around the middle in another way. How many edges does it touch? What is its length?

12. Cut enough 1-inch squares to cover the surface of the cube. Draw a rectangle having the same surface as the sum of these squares.

13. How many edges of the cube meet at one point? How many such points are there?

Material: 2 dozen 1-inch cubes



1. Build 2 rows of 2 cubes each. How many cubes in them?

2. Build 2 layers like that in the picture.

3. How many cubes are used?

4. How long is the whole group? How wide? How high? What is its shape? It is a **2-inch cube.**

5. Build a solid of 2 rows of 4 cubes each. How many cubes in the solid? Build two such layers.

6. What is the length of this solid? Its breadth? Its thickness? How many cubes in it?

7. Build a solid of 3 rows of 3 cubes each. How many cubes are there in the solid?

8. Build a solid having 3 such layers. What is its length? Breadth? Thickness? How many cubes in it?

9. Build one row of 8 cubes. Build a solid of two such rows. What is its length? Width? Thickness? How many cubes in it?

10. Build a solid of 3 such layers. What is its length? Its width? Its thickness?

11. Build a solid of 3 rows of 4 cubes each. What is its length? Its breadth? Its thickness?

12. How many cubes in the solid just built?

Material: 4-inch sticks

1. Place two sticks in the form of a V; two others in the form of a T; two others side by side.

2. How many sticks are used to build 2 of these figures? 3 of them?

3. Place two other sticks in a new form. How many sticks have been used in all? How many pairs of sticks?

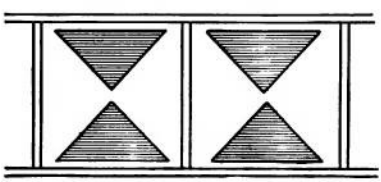
4. Place two other sticks in another form; in still another form. How many sticks have been used in all?

5. Place three sticks in the form of an H; three others in the form of a Y; three others in a new form. How many sticks are used to build 2 of these forms? 3 such forms? 4 such forms? 5 such forms?

6. Place 4 sticks in the form of a square; 4 others in the form of a W. Make two new forms of 4 sticks each.

7. How many sticks are used to build 2 of these forms? 3 of them? 4 of them?

8. The picture below is part of a border. How many shaded parts are there in each square? How many in 2 such squares? In 3? In 4? In 5? In 8?



Material: A dime, a cent, and a 5-cent piece

Oral.

1. How many cents are equal in value to a 5-cent piece?

2. How many cents are equal in value to 2 5-cent pieces?

3. How many cents in a dime? How many 5-cent pieces are equal in value to a dime?

4. A dime is worth how many more cents than a 5-cent piece?

5. Five cents are what part of a dime?

6. How many 5-cent pieces are equal in value to 2 dimes?

7. How many cents are equal in value to a 5-cent piece and 2 cents? To a 5-cent piece and 3 cents? To a 5-cent piece and 4 cents?

8. If you have a 5-cent piece and make a 3-cent purchase, how many cents have you left?

9. How many cents are there in 2 cents and 2 cents and 5 cents?

10. What stamps can you buy with a 5-cent piece and spend it all? Give another answer; still another.

11. How much more is a 5-cent piece worth than 2 two-cent stamps?

12. How many 2-cent stamps can you buy with a dime? How many 5-cent stamps can you buy with a dime?

13. A 5-cent stamp and two 2-cent stamps are worth how much less than a dime?

Oral.

1. Count the candles on the Christmas tree.

2. What did they cost at 2 for a cent?

3. How many apples are there on the tree?

4. What did the apples cost at 2 cents each?

5. How many more candles are there than apples?

6. Which cost the more? How much?

7. How many dolls are there on the tree? What did they cost at 3 cents each?

8. Ruth received one doll and the 5-cent doll chair. How much did these presents cost?

9. Lucy received the other 2 dolls and an 8-cent doll's bed. How much did these presents cost?

10. The wooden soldiers on the table were for Frank. How many did he get?

11. Each of the children received a 5-cent rubber ball. How much did the 3 balls cost?

12. The 10-cent cannon was also Frank's present. If the soldiers cost 1 cent each, what did the cannon and soldiers cost?

Oral.

1. Charles earned 5 cents by doing an errand and 8 cents by selling papers; how many cents did he earn in all?

2. Ada bought 3 yards of ribbon at 3 cents a yard; how much did it cost her?

3. Lulu paid 6 cents for some cloth marked 12 cents a yard; how much cloth did she buy?

4. What is the cost of $2\frac{1}{2}$ quarts of milk at 6 cents a quart?

5. When 2 yards of tape cost 4 cents, what does 1 yard cost? What do 6 yards cost?

6. Willard paid 16 cents for 4 bunches of radishes; how much did they cost per bunch?

Make and solve problems like those above, using the following facts:

7. A boy earns 5 cents by going to the store for a neighbor and 10 cents by cleaning his sidewalk.

8. Mary bought 4 cents worth of cloth at 10 cents a yard.

9. Julia paid 9 cents for milk at 6 cents a quart.

10. Frank paid 25 cents for sugar at 5 cents a pound.

11. Sarah paid 20 cents for 4 spools of thread.

12. Lawrence bought $1\frac{1}{2}$ pounds of butter at 16 cents a pound.

13. A man bought 7 pounds of nails at 3 cents a pound.

Material: A dozen 4-inch sticks

1. How many double windows are there in the front of this building above the first story?

2. How many double windows in each story?

3. How many columns of double windows in the building? How many double windows in each column above the first story?

4. How many single windows are there in each story? In each column?

5. Show from the picture the number of 2s in 8; in 14; in 20.

6. Place equal sticks on the desk to form a square. How many sticks are needed to make a square? How many inches in the sum of the sides?

7. How many sticks are needed to make 2 squares?

8. How many squares can be made from 12 sticks?

9. Place three sticks on the desk to form a triangle. How do the sides of this triangle compare in length?

10. Make another triangle. How many sides have 2 triangles?

11. How many triangles can be made with 9 sticks?

Oral.

1. With 4-inch sticks make the letter **M**. How many are needed for the word **W I N**?

2. How many pieces 9 inches long can be cut from a strip of paper $1\frac{1}{2}$ feet long?

3. I bought 20 cents' worth of 2-cent stamps; how many stamps did I buy?

4. A picture block of six faces has a letter or a picture on each face. How many letters and pictures on 3 such blocks?

5. On half of the faces there are letters and on the others there are pictures. How many letters are there?

6. Susie had a box of 16 blocks. The first week she lost 7, the next week 5; how many had she left?

7. The next week she lost half of what she then had; how many were still left?

8. On the blocks still left, $\frac{1}{3}$ of the letters were so marred that they could not be read; how many letters could be read?

9. What is the sum of the sides of a triangle if each side is 5 in. long? If each side is 6 in. long?

10. How many triangles 3 inches on each side can be made from a stick 18 inches long?

11. If 1 inch in a drawing stands for 1 foot in the object, how long is a line which stands for 4 yards?

12. How many sides have 3 squares? 4 squares?

13. How many feet and how many inches besides are there around a square 5 inches on a side?

Oral.

1. What is the cost of 5 wooden soldiers at 2 cents each? What is the cost of 2 soldiers at 5 cents each?

2. How many soldiers at 3 cents each can be bought for 15 cents?

3. What is the cost of 2 5-cent guns and a 5-cent wagon? Of a ten-cent gun and a 5-cent wagon?

4. What is the cost of 2 5-cent wagons and a 10-cent doll's carriage?

5. How many 3-cent cars can be bought for 12 cents?

6. What will be the cost of 5 2-cent cars and a 10-cent engine?

7. How many 5-cent cars will 15 cents buy?

8. What is the cost of a 10-cent engine and a set of 10-cent blocks?

9. How much more does a 10-cent engine cost than 2 4-cent cars?

10. What is the cost of 3 3-cent dolls and a 10-cent doll's carriage?

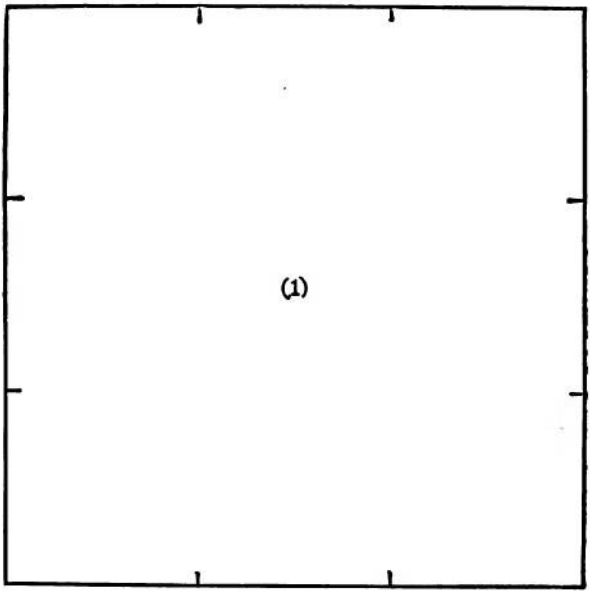
11. How much more do 2 sets of 5-cent blocks cost than 2 3-cent soldiers?

12. How many sets of 5-cent blocks can be bought for 20 cents?

13. If toy soldiers cost 4 cents each, how many can be bought for 20 cents?

14. What is the cost of 2 rubber balls at 5 cents each and a top at 6 cents?

15. Make and solve other problems about toys.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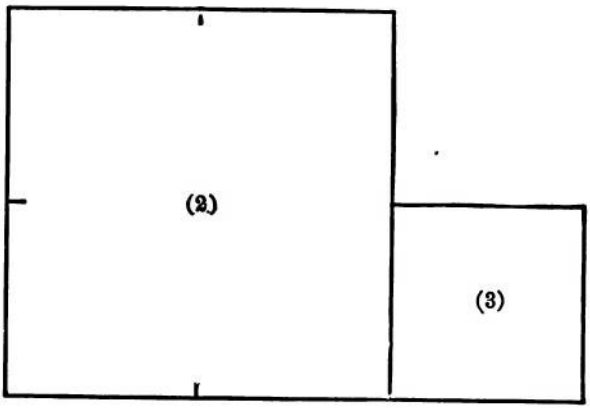
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1. Which is the smallest square on the opposite page? Which is the largest?

2. Name the squares in the order of their size.

3. The third square contains 1 square inch (a **1-inch square**); how many does the second contain?

4. How many square inches does the first square contain?

5. The surface of the third square is what part of that of the first square?

6. The surface of the third square is what part of that of the second square?

7. Draw a figure to show three 1-inch squares placed side by side.

8. The surface of this figure is what part of the surface of the first square on the opposite page?

9. Draw a figure that will be $\frac{2}{3}$ as large as the first square on the opposite page.

10. Draw a figure that will be twice as large as the second square on the opposite page.

11. Draw a square like (1) on page 26. Connect the opposite points so as to divide it into 1-in. squares.

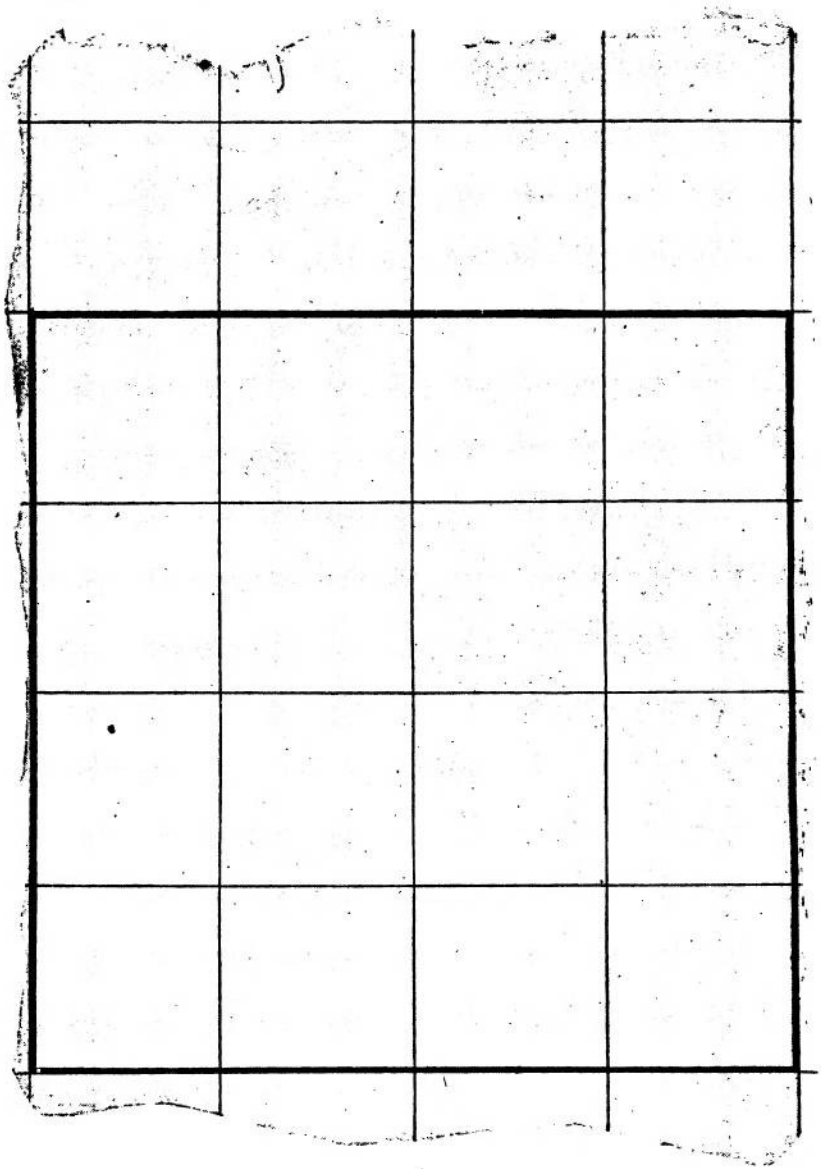
12. How many 1-in. squares are made in Exc. 11?

13. Draw on the board a 3-ft. square and divide it into square feet.

14. How many square feet in a 3-ft. square?

A square 3 feet on a side is called a **square yard.**

15. How many square feet (1-foot squares) are there in 1 square yard (a 1-yard square)?



Material: Paper ruled in inch squares like that on page 28. It may be prepared by the pupil

1. Draw a rectangle containing 6 square inches. What is its length? Its breadth?

2. Draw a square containing 4 square inches. What is the length of a side of the square?

3. Draw a rectangle of another shape having 4 square inches. What is its length? Its breadth?

4. Draw a square containing 9 square inches. What is the length of a side of the square?

5. Draw a rectangle of another shape having 9 square inches. What is its length? Its breadth?

6. Draw a rectangle containing 16 square inches. What is its length? Its breadth?

7. Draw a rectangle of another shape having 16 square inches. What is its length? Its breadth?

8. State the length and breadth of still another rectangle having 16 square inches.

9. Which rectangle of Exercises 6 to 8 is like that on page 28?

10. Draw a rectangle containing 10 square inches.

11. Draw one of different shape having 10 square inches. What is the length of each? The breadth?

12. How many feet are there around a square 2 feet on a side? 3 feet on a side? 4 feet on a side?

13. How many feet are there on the side of a square that is 4 feet around? 8 feet around? 12 ft.?

14. How many more feet are there around a square that is 3 ft. on a side than around one that is 2 ft.?

Material: Paper ruled in inch squares

1. Draw a rectangle containing 12 square inches. What is its length? Its breadth? Draw another rectangle containing 12 square inches.

2. Draw a rectangle equal to the sum of a 1-inch square and a 3-inch square.

3. Draw a rectangle equal to the sum of a 3-inch square and a 4-inch square.

4. Draw a square equal to the sum of a 3-inch square and a 4-inch square.

5. Show that a 4-inch square is 4 times as large as a 2-inch square.

6. Draw a rectangle 8 inches long and containing 16 square inches.

7. Draw a rectangle 4 inches long and containing 12 square inches.

8. If one face of a cube contains 4 1-inch squares, how many such squares are there on 3 faces?

9. How many piles of 3 cubes can be made from 9 cubes? From 12 cubes?

10. How many piles of 2 cubes each can be made from 12 cubes?

11. How many cubes are there in 4 piles of 3 cubes each?

12. How many cubes are there in 3 piles of 4 cubes each?

13. How many cubes are there in 2 piles of 6 cubes each?

14. How many cubes are there in 6 piles of 2 cubes each?

Oral. Add the columns from the bottom to the top: Thus in Exercise 1, say "six, nine, ten."

1.	2.	3.	4.	5.
1	2	3	4	3
3	4	5	0	3
5	2	1	5	3
1	2	1	1	1
6.	7.	8.	9.	10.
5	3	6	4	4
4	6	2	3	3
1	2	3	5	2
5	4	2	1	3
11.	12.	13.	14.	15.
1	7	4	3	7
1	7	4	6	5
5	1	4	7	3
2	1	5	2	5
2	3	1	2	0

Name the number that, added to the smaller number, makes the larger: Thus in Exercise 1, 6 and 4 are 10. Say "four."

1.	2.	3.	4.	5.
10	10	10	10	10
6	5	4	3	2
6.	7.	8.	9.	10.
10	11	10	11	11
8	9	7	8	6
11.	12.	13.	14.	15.
11	12	12	12	12
4	5	7	3	6
16.	17.	18.	19.	20.
12	12	12	11	12
8	9	10	10	11

1. How many inches in $\frac{1}{2}$ ft.? $\frac{1}{3}$ ft.? $1\frac{1}{4}$ ft.?

2. Make two marks on paper $\frac{2}{3}$ ft. apart as nearly as you can judge; two others $\frac{1}{4}$ ft. apart. Test by measuring.

3. Read and supply the proper number words:
1 and 5 are —. 7 and 2 are —. 4 and 4 are —.
5 and — are 7. 8 and — are 9. 2 and — are 8.

4. How many 2s in 6? In 10? In 8? In 14?

5. Count by 2s from 8 to 16; from 1 to 9.

6. Draw a rectangle 3 in. by 4 in. How many 1-in. sticks would be needed to fence it?

7. How many 1-in. sticks are needed to divide it into three equal lots? If there are 4 lambs in each lot, how many in the whole field?

8. Read: 4 and 7 are —. 6 and 5 are —.
8 and 4 are —. 7 and 6 are —.

9. Add:

7	9	8	7	9	6	7	9
5	4	3	7	5	9	8	2

10. How many tens and how many ones besides in 15? 17? 11? 10? 20? 18?

11. Draw a line $1\frac{1}{2}$ ft. long. How many inches in it?

12. Divide the line into 3-in. spaces. How many are there?

13. Look about for some object that you think is $1\frac{1}{2}$ ft. long. Test by measurement.

14. How many faces has a cube? Two cubes? Three cubes?

1. How many 3-in. sticks are needed to build 2 triangles? 3 squares? 3 triangles and 2 squares?

2. How many inches around such a triangle? Such a square?

3. Henry bought 2 two-cent stamps and 3 postal cards. How much change did he get from a dime?

4. At 2 for a cent, how many marbles can you buy for 4 cents? For 7 cents? For 8 cents?

Make and solve problems:

5. A half pound of tacks costs 5 cents.

6. Martha bought 3 yd. of calico at 4 cents a yard.

7. William spent 18 cents for oranges at 3 cents each.

8. Rubber balls cost 4 cents each and tops 5 cents.

9. Draw a square to represent a square yard, letting 1 inch in the drawing represent 1 foot. How many inches around the drawing? How many feet?

10. Draw two rectangles of different shape, but each containing 12 square inches.

Add:

11.	12.	13.	14.	15.
5	2	8	1	4
3	1	1	4	4
2	7	3	0	5
4	0	2	6	2

Name the number that, added to the smaller number, makes the larger:

16.	17.	18.	19.	20.
11	13	15	10	12
5	7	4	8	6

Material: A pint measure, a quart measure, a gallon measure, and some water

1. Fill the pint measure and pour the water into the quart measure. Repeat until the quart measure is full. How many pints are there in a quart? One pint is what part of a quart?

2. Fill the quart measure and pour its contents into the gallon measure. Repeat until the gallon measure is full. How many quarts are there in a gallon?

2 pints make 1 quart. (2 pt. make 1 qt.)
4 quarts make 1 gallon. (4 qt. make 1 gal.)

1. How many times must the contents of the pint measure be poured into the gallon measure to fill it? How many pints are there in a gallon?

2. How many pints are there in $\frac{1}{2}$ of a gallon? In 2 quarts? In 3 quarts?

3. How many pints are there in $\frac{3}{4}$ of a gallon? In $\frac{1}{4}$ of a gallon?

4. 6 pints are how many quarts? 6 pints are what part of a gallon? 4 pints are what part of a gallon? 3 pints are what part of a gallon?

5. How many quarts are there in 2 gallons? In 4 gallons? In 3 gallons?

6. How many pints are there in 2 gallons and 1 quart? In 3 gallons and 1 pint?

7. A cook used a pint of molasses at each baking; how many bakings did she make with a gallon?

8. Roland made 2 gallons of lemonade and sold it in $\frac{1}{2}$-pint glasses; how many glasses did he sell?

9. How many times can a lamp holding $1\frac{1}{2}$ pints of oil be filled from 3 gallons of oil?

10. A tank on an oil-stove holds 4 quarts; how many times can it be filled from a 5-gallon can of oil?

11. If a quart of ice-cream makes 6 dishes, how many dishes does 2 quarts make? 3 quarts?

12. When 3 quarts of vinegar have been used out of a gallon, what part of the gallon remains?

13. If pans, pails, watering-pots, or the like, can be had, estimate the capacity of each and test your estimate by measuring the quantity of water it holds.

Oral.

1. Susie bought 4 yards of calico at 2 cents a yard; how many cents did the cloth cost her?

2. Jane bought 3 yards of calico at 5 cents a yard; how much change did she receive from 2 dimes?

3. One-half of 6 inches is what part of a foot?

4. How many feet in $\frac{1}{3}$ of a yard?

5. What is the distance around a 3-inch square?

6. How many 2-cent pencils can be bought for what 1 10-cent pencil costs?

State and solve problems like 1–6 *using these facts:*

7. Calico costs from 2 to 5 cents a yard. (Both 1 and 2 are problems using the fact of 7.)

8. Bananas cost from 1 cent to 3 cents each.

9. Cookies cost 10 cents a dozen.

10. Bread costs 5 or 10 cents a loaf.

11. Little dolls cost from 1 cent to 10 cents each.

12. Glass marbles cost from 1 cent to 10 cents each.

13. Rubber balls cost from 5 cents to 10 cents each.

14. Lead-pencils cost from 1 cent to 10 cents each.

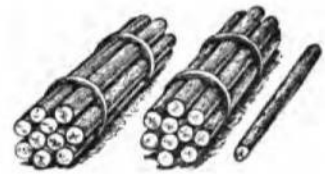
15. Small writing-tablets cost from 1 cent to 10 cents each.

16. Thread costs from 3 cents to 5 cents a spool.

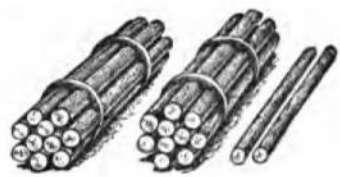
17. A square yard is 3 feet on a side.

18. A 2-inch square is 2 inches on each side.

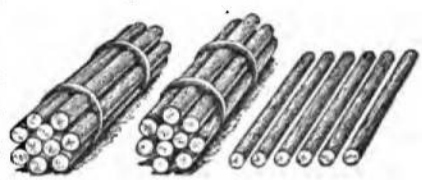
Material: Loose sticks and bundles of 10 sticks each



1. Take two bundles of 10 sticks each and 1 stick more. How many sticks are there in all? 20 and 1 are —. 20 and — are 21. 1 and — are 21.

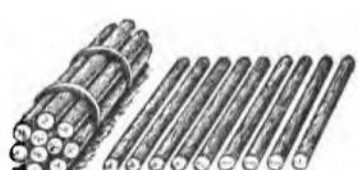


2. Take two bundles and 2 sticks more. How many are there in all? 20 and 2 are —. 20 and — are 22. 2 and — are 22.



3. Take two bundles and 6 sticks more. How many sticks are there in all? 20 and 6 are —. 20 and — are 26. 6 and — are 26.

4. In the same way find:
20 and 3 are —. 20 and — are 23. 3 and — are 23.
20 and 7 are —. 20 and — are 27. 7 and — are 27.
20 and 9 are —. 20 and — are 29. 9 and — are 29.



5. To one bundle and 9 sticks add enough to make 2 bundles and 1 stick.

6. How many sticks were there at first? How many sticks did you add?

7. 19 and 2 are —. 19 and — are 21. 2 and — are 21.

In the same way as on the last page build:

1.	18 and 3.	18 and — are 21,	3 and — are 21.
2.	18 and 6.	18 and — are 24,	6 and — are 24.
3.	17 and 4.	17 and — are 21,	4 and — are 21.
4.	17 and 5.	17 and — are 22,	5 and — are 22.
5.	16 and 5.	16 and — are 21,	5 and — are 21.
6.	16 and 8.	16 and — are 24,	8 and — are 24.
7.	16 and 9.	16 and — are 25,	9 and — are 25.
8.	15 and 6.	15 and — are 21,	6 and — are 21.
9.	15 and 8.	15 and — are 23,	8 and — are 23.
10.	15 and 10.	15 and — are 25,	10 and — are 25.
11.	14 and 12.	14 and — are 26,	12 and — are 26.
12.	14 and 16.	14 and — are 30,	16 and — are 30.
13.	12 and 18.	12 and — are 30,	18 and — are 30.
14.	11 and 19.	11 and — are 30,	19 and — are 30.
15.	10 and 20.	10 and — are 30,	20 and — are 30.

Read and supply the number words:

16.	1 and 5 are —,	11 and 5 are —,	21 and 5 are —.
17.	1 and 8 are —,	11 and 8 are —,	21 and 8 are —.
18.	3 and 1 are —,	13 and 1 are —,	23 and 1 are —.
19.	3 and 4 are —,	13 and 4 are —,	23 and 4 are —.
20.	5 and 3 are —,	15 and 3 are —,	25 and 3 are —.
21.	6 and 4 are —,	16 and 4 are —,	26 and 4 are —.
22.	3 and — are 7,	13 and — are 17,	23 and — are 27.
23.	5 and — are 9,	15 and — are 19,	25 and — are 29.
24.	4 and — are 9,	14 and — are 19,	24 and — are 29.

Oral.

1. How much does the milkman charge per quart for milk?

2. What is the cost of 2 quarts of milk at this price? Of 3 quarts? Of 5 quarts? Of 4 quarts?

3. When milk is 4 cents a quart, how much will $2\frac{1}{2}$ quarts cost? $3\frac{1}{2}$ quarts? $1\frac{1}{2}$ quarts?

4. If a family uses 2 quarts a day, how many quarts do they use in 2 days? In 3 days? In 6 days?

5. At 5 cents a quart, what does it cost this family for milk per day? What does it cost them for milk in 2 days? In 4 days? In 5 days?

6. When milk is 6 cents a quart, how many cents do you get in change, if you pay for 2 quarts with a dime and a nickel?

7. When milk is 5 cents a quart, how many quarts can you buy for 10 cents?

8. At 6 cents a quart, how many quarts can you buy for 15 cents?

9. What change must you have to pay exactly for 3 quarts of milk at 6 cents a quart?

10. In order to save the trouble of making change what does the milkman sell that may be exchanged for milk?

11. When milk is 3 cents a pint, how many pint tickets can you buy for 24 cents? How many quarts of milk will these tickets buy?

12. How many pint tickets are worth as much as 2 quart tickets and 3 pint tickets?

Oral.

1. How much is a single fare on the street-car?

2. How much are 2 such fares? 3 such fares? 4 fares?

3. George and his sister ride in the car to and from school. If the fare is 5 cents, how much does it cost them to come to school? To go home? How much does it cost them to make one round trip a day?

4. How many 5-cent fares can be paid with 15 cents? With 20 cents? With 25 cents?

5. Willard took the car to and from the city and made a 12-cent purchase; how much had he left out of 25 cents?

6. What does the conductor sell that can be used instead of money to pay for rides?

7. If the fare is 5 cents, 6 tickets are often sold for 25 cents. How many rides can be taken for 50 cents, if tickets are purchased?

8. When tickets are 6 for 25 cents, how many boys can ride to the museum and back for 25 cents?

9. When the fare is 3 cents, how many rides can be taken for 9 cents? For 15 cents? For 21 cents? For 30 cents?

10. What is the cost of 6 three-cent tickets? What is the cost of 8 three-cent tickets?

11. Mark bought 6 three-cent tickets and gave the conductor 25 cents, what change did he receive?

12. Lucile takes 3 friends for a trolley-ride. They go to the park and return. How much does she pay in 3-cent fares?

Oral.

1. Chester rides to and from school on the car. If the fare is 3 cents, how much does it cost him a day? How much does it cost in 3 days? In 5 days?

2. Minnie bought a glass of lemonade for herself and for each of two friends. What did it cost her at 5 cents a glass?

3. A man went to the city Tuesday morning and returned the following Monday morning; how many days was he away?

4. A man drove 30 miles in 3 hours; how many miles per hour did he travel?

5. $\frac{1}{3}$ of my money is 4 cents; how many cents have I?

Make and solve problems like 1–5, *using the following facts:*

6. The fare on a street-car is 3 cents or 5 cents.

7. One ride on the merry-go-round costs 5 cents.

8. Three pop-corn balls are sold for 5 cents.

9. Clara went visiting Monday morning and came home Friday morning of the same week.

10. Gertrude made 4 rosettes of the same size out of two yards of ribbon.

11. Charles rode to the city and back on the car, made an 8-cent purchase, and spent in all 18 cents.

12. At another time he rode only one way, bought 3 writing-tablets at 4 cents each, and spent in all 17 cents.

1. Without measuring, draw on the blackboard 3 lines of different lengths, each several feet long.

2. Estimate the lengths of these lines in feet and record the results.

3. Test the accuracy of your estimates by measuring the lines to the nearest foot.

4. On the same line with each estimate write the measured result, and also the difference.

The difference is the **error** of your estimate.

5. In how many of these estimates was your error more than 1 foot?

6. With a rule draw a line on the blackboard 2 feet long. How many inches long is it?

7. Without the rule draw four lines, trying to make one of them $\frac{1}{2}$ as long as that of Exercise 5; another $\frac{1}{3}$ as long; another $\frac{2}{3}$ as long; another $\frac{1}{4}$ as long.

8. Write a list of what the lengths of these lines should be in inches.

9. Test the accuracy of your drawing by measuring the lines to the nearest inch.

10. On the same line with each number written in Exercise 8, write the length as measured and the error.

11. How many of your errors are larger than 2 inches?

12. Place two marks 1 yard apart as nearly as you can judge without measuring.

13. Measure in inches this distance. What is the error in inches of your estimate?

NOTATION

Tens and Ones

1. 10 books and 10 books and 1 book are how many books? Twenty-one are how many tens and how many ones besides? In 21 which figure shows the number of tens and which the number of ones besides?

2. Twenty-five are how many tens and how many ones besides? In 25 which figure shows the number of tens and which the number of ones besides?

3. 20 feet and 10 feet are how many feet? Thirty are how many tens? In thirty which figure shows the number of tens? What does the other figure show?

4. How many tens and how many ones besides in 21? 25? 29? 24? 20? 30? 35? 36? 39? 27? 33?

Write in figures the numbers:

5. Five tens or fifty; fifty-four; fifty-nine.

6. Seven tens or seventy; seventy-seven.

7. Nine tens or ninety; ninety-five; ninety-nine.

8. Counting from the right, which figure shows how many tens in the number and which shows the number of ones besides?

Instead of saying the number of ones besides one usually says, "the number of units." Thus, in 43, 4 is the number of tens and 3 the number of units.

9. How many tens and how many units in each of the following numbers:

54, 59, 68, 77, 74, 81, 84, 99, 95?

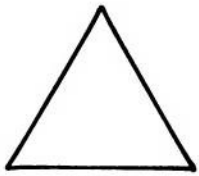


Fig. 1

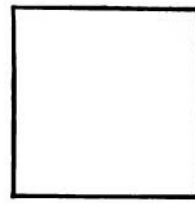


Fig. 2

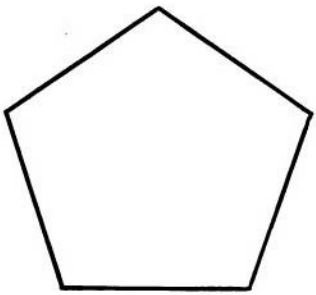


Fig. 3

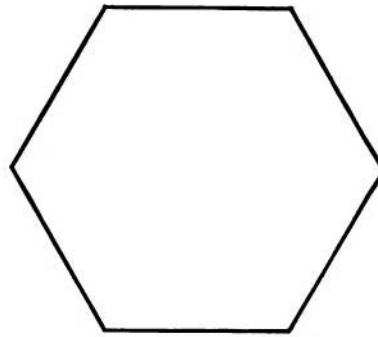


Fig. 4

Material: A dozen 10-inch sticks

1. How many sides has Figure 1? Build a form like this.

2. How many inches are there in each side of the triangle? How many inches are there in the sum of the three sides? How many are 3 times 10?

3. Build a form like Figure 2. How many sides has it? How many are 4 times 10?

4. Build a form like Figure 3. How many sides has it? How many are 5 times 10?

5. Build a form like Figure 4. Then add one more side, and so on. How many are 6 times 10? 7 times 10? 8 times 10? 9 times 10?

Oral.

1. Count by ones to 25. Which number is reached first, 20 or 25? Which number is reached first, 20 or 15? 10 or 20? 15 or 25?

2. Count by ones to 5. Count by tens to 50. Which is the larger number, 40 or 50? 30 or 40? How many ones in 5? How many tens in 50?

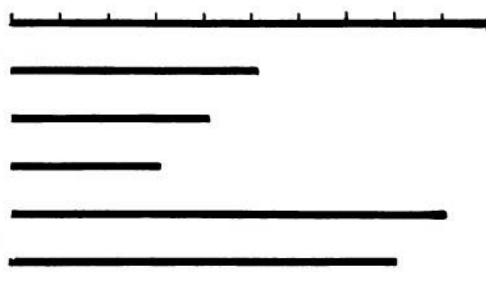
10 tens are **one hundred** ones. The symbol for one hundred is 100.

3. Count by ones to 10. Count by tens to 100.

1	2	3	4	5	6	7	8	9	10
10	20	30	40	50	60	70	80	90	100

What number is $\frac{1}{2}$ of 10? What number is $\frac{1}{2}$ of 100? How many fives are there in ten? How many fifties are there in 100?

4. Let the top line represent 10; what number does the next line represent? The next? The next? The fifth? The sixth? Let the top line represent 100; what number does the next line represent? The next? The third? The fourth? The fifth? The sixth?



5. 5 tens and 3 tens are —. 50 and 30 are —.

6. 7 tens and 2 tens are —. 70 and 20 are —.

Table 1 (2)	(1)
20 and	1
30 "	3
40 "	5
50 "	7
60 "	9
70 "	5
80 "	2
90 "	6
10 "	1

Table 2 (2) (1)
21
33
45
57
69
75
82
96
11

1. Compare the numbers in Table 1 with those in Table 2, taken in order.

2. Which column of Table 2 stands for the number of tens, and which stands for the number of units?

In all whole numbers the first figure at the right represents units, and the second figure represents tens.

The symbols 1, 2, 3, 4, . . 9 are called **digits.**

The first digit at the right in any whole number is called **units' digit** and the place **units' place.** The second digit from the right is called **tens' digit** and the place **tens' place.**

Thus, in 86 the units' digit is 6 and the tens' digit is 8.

3. Which is the units' digit in 49? Which is the tens' digit? 4 in tens' place means what number?

4. How many dimes in 75 cents and how many cents besides?

5. In 75 cents which figure stands for the number of dimes and which for the number of cents besides?

Write, using digits:

6. Thirty; thirty-five; thirty-six; forty-five; ninety-four.

7. Ninety-nine; ninety-five; ninety-one; eighty-nine; eighty-five; sixty-six.

1. How many tops at 3 cents each can be bought for 12 cents?

2. How many balls at 4 cents each can be bought for 12 cents?

3. 30 and — are 70. 20 and — are 80.

4. Draw a rectangle 6 inches long containing 12 square inches; one 6 inches long containing 18 square inches.

5. If a rectangle 4 inches long and 3 inches wide is covered with 2 layers of 1-inch cubes, how many cubes are there?

Add:

6. 20 7	7. 20 8	8. 21 3	9. 22 5	10. 23 7
11. 21 8	12. 24 6	13. 25 3	14. 25 5	15. 26 4

16. How many 3-cent penholders can be bought for 15 cents?

17. Robert bought a 5-cent pencil, a 5-cent tablet, and a 3-cent ball; what change did he have out of 15 cents?

18. Jennie poured $1\frac{1}{2}$ gallons of milk into pint bowls, filling each; how many bowls did she use?

19. A gallon of milk is put into pint bottles; how many bottles are used?

20. When milk is 5 cents a quart and cream 20 cents a quart, how many quarts of milk is one quart of cream worth?

ADDITION AND SUBTRACTION TO 100

Addition

Instead of saying "Three and four are seven," one usually says "Three **plus** four **equals** seven." **Plus** means **and**.

The symbol + is used for **plus**, and = is used for **equals**, and one writes 3+4=7.

Read and give the sum in each case:

1.	10+1=—,	20+1=—,	30+1=—.
2.	10+9=—,	20+9=—,	30+9=—.
3.	10+5=—,	30+5=—,	50+5=—.
4.	10+7=—,	90+7=—,	60+7=—.

Observe the relation of the sums in each line:

5.	1+3=—,	10+1+3=—,	11+3=—.
6.	2+3=—,	10+2+3=—,	12+3=—.
7.	3+4=—,	10+3+4=—,	13+4=—.
8.	2+5=—,	10+2+5=—,	12+5=—.
9.	3+6=—,	10+3+6=—,	13+6=—.
10.	5+4=—,	10+5+4=—,	15+4=—.
11.	18+1=—,	28+1=—,	38+1=—.
12.	13+5=—,	23+5=—,	53+5=—.
13.	11+7=—,	41+7=—,	61+7=—.
14.	14+3=—,	34+3=—,	54+3=—.
15.	11+5=—,	31+5=—,	61+5=—.

Oral.

1. Count by fives from 5 to 25; to 50.

2. How many school-days are there in a week?

3. How many days are there in a week?

4. How many school-days are there in 2 weeks? In 3 weeks? In 4 weeks? In 5 weeks?

5. George goes to school 4 da. one week, 4 the next, and 2 the next; this is — school-weeks.

6. How many school-days in 4 weeks? How many other days? How many days in all in 4 weeks?

7. How many school-days in 6 weeks? In 5?

8. In 1 month Flora went to school 4 weeks and 2 days besides; how many days was this?

9. Howard was present $\frac{3}{5}$ of the time in 4 weeks; how many days was this?

10. He was present $\frac{4}{5}$ of the time the next month; how many days was he present in both months?

11. Julia was at school $\frac{4}{5}$ of one week, $\frac{3}{5}$ of the next, $\frac{2}{5}$ of the next, and all of the next; how many days was this?

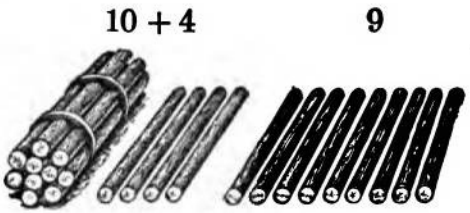
12. In how many classes are you present in a day? In 2 days? In 3 days? In a week?

13. How many months in this school-term? In each school-term in the year? In the whole year?

14. At what time does your school begin in the morning? When does it close in the afternoon?

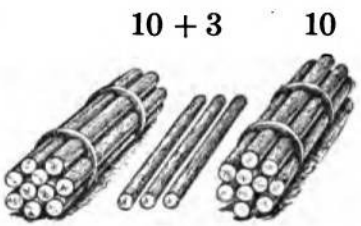
15. How many hours from the opening of school to its close?

1. How many sticks are 14 sticks and 9 sticks, as shown in the first picture?

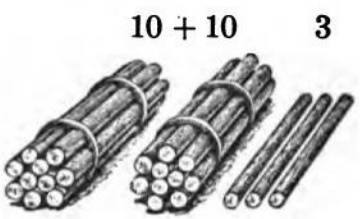


2. How many sticks must be put with the 9 sticks in this picture to make a bundle of 10?

3. From what group of sticks is this taken, as shown in the second picture?



4. This makes how many bundles and how many sticks besides, as shown in the third picture? How many are 14 sticks and 9 sticks?



$$\begin{array}{rr} 10 + 4 & \text{or } 14 \\ \underline{\quad\quad 9} & \underline{\quad 9} \\ 10 + 10 + 3 & 23 \end{array}$$

9 units + 4 units = 13 units = 1 ten + 3 units.

1 ten + 1 ten = 2 tens. Then, 14 + 9 = 23.

5. If there are 36 carnations in one vase and 18 roses in another, how many flowers are there in all?

6. When there are 19 poppies in one bed and 42 geraniums in another, how many flowers in both beds?

7. Laura picked 15 nasturtiums and Florence picked 29; how many did they both pick?

Written.

1. There are 28 telephone-poles on one side of the street and 21 on the other; how many are there on both sides?

2. On a street there are 24 telephone-poles that belong to one company and 33 that belong to another; how many are there in all?

3. After a storm 17 of the telephone-poles in a mile of line are blown down and 23 are left standing; how many were there in the mile?

4. There are 64 telephone-wires on a pole and 18 telegraph-wires; how many wires on the pole?

5. Of the wires on a pole, 13 are light wires, 17 are telegraph-wires, and 48 are telephone-wires; how many wires on the pole?

6. One telephone-pole is 42 feet long and another is 57 feet long. If they are laid end to end in the street, how far will they reach?

7. It is 52 yards from one pole to another and 44 yards from the latter pole to a third one; how many yards is it from the first pole to the third one?

8. A man climbs a pole to the first wire and is 28 feet high; he climbs 13 feet higher to another wire, and then 17 feet higher to the top of the pole; how high is the pole?

9. The distance between two poles is 46 yards; how many yards of wire in two lines between them?

10. A man 6 feet tall standing on a load of hay 12 feet above a wagon 4 feet high, just reaches a telephone-wire; how high above the street is the wire?

Oral. Read and supply the number words observing the relation of the facts in each line:

1.	7 + 6 = —,	7 + — = 13,	6 + — = 13.
2.	17 + 6 = —,	17 + — = 23,	6 + — = 23.
3.	8 + 9 = —,	8 + — = 17,	9 + — = 17.
4.	7 + 8 = —,	7 + — = 15,	17 + — = 25.
5.	9 + 6 = —,	6 + — = 15,	26 + — = 35.
6.	8 + 9 = —,	8 + — = 17,	18 + — = 27.
7.	28 + 9 = —,	28 + — = 37,	48 + — = 57.
8.	58 + 9 = —,	58 + — = 67,	78 + — = 87.
9.	9 + 7 = —,	9 + — = 16,	19 + — = 26.
10.	29 + 7 = —,	29 + — = 36,	49 + — = 56.
11.	10 + 4 = —,	10 + — = 14,	20 + — = 24.
12.	30 + 4 = —,	30 + — = 34,	70 + — = 74.
13.	11 + 5 = —,	11 + — = 16,	21 + — = 26.
14.	41 + 5 = —,	41 + — = 46,	61 + — = 66.
15.	16 + 6 = —,	16 + — = 22,	26 + — = 32.
16.	46 + 6 = —,	46 + — = 52,	66 + — = 72.
17.	19 + 3 = —,	19 + — = 22,	39 + — = 42.
18.	59 + 3 = —,	59 + — = 62,	89 + — = 92.
19.	20 + 12 = —,	20 + — = 32,	40 + — = 52.

Copy and add:

20.	25	21. 33	22. 44	23. 67
	67	28	39	24
24.	26	25. 36	26. 46	27. 56
	14	24	24	34

A man has a farm of 78 acres and sells 32 acres; how many acres has he left?

Find the difference between 78 acres and 32 acres.

$$\begin{array}{r} 70 + 8 \text{ or } 78 \\ 30 + 2 \text{ or } 32 \\ \hline 40 + 6 \text{ or } 46 \end{array}$$

Test: $46 + 32 = 78$.

One thinks "2 units and 6 units are 8 units" and writes 6 in units' place; "3 tens and 4 tens are 7 tens" and writes 4 in tens' place. The man has 46 acres left.

1. A lawn is 22 yards wide and 33 yards long. It is how many yards longer than it is wide?

2. From city A to city B is 42 miles; from A to C is 54 miles. From B to C is — miles.

3. How many miles farther is it from A to B than from B to C?

4. The floor of one room contains 36 square yards and that of another 24 square yards; how many more square yards in the larger floor than in the smaller?

Subtract and test by addition:

5. 49 29	6. 49 38	7. 68 17	8. 45 25
9. 66 44	10. 77 33	11. 97 35	12. 58 46
13. 79 39	14. 44 33	15. 97 35	16. 76 24

NOTE.—The teacher will add as many such exercises as circumstances require.

Oral.

1. In a train of 28 box and coal cars, 8 are coal cars; how many are box cars?

2. There are 20 cars in one train and 25 in another; how many cars are there in both trains?

3. A train of 50 cars parted between the thirtieth and the thirty-first cars from the rear end; how many cars were left with the engine?

4. Of 48 cars in a train 36 are loaded, how many are empty?

5. If one engine can draw 40 cars and another can draw 45, how many cars can the two engines draw?

6. In a freight yard there are 8 coal cars, 20 box cars, and 15 cattle cars; how many cars are there in the yard?

7. One coal car carries 35 tons and another 42 tons; how many do they both carry?

8. Three box cars are loaded with cabbages; the first car carries 32 tons, the second 23 tons, the third 25 tons. How many tons are there on the 3 cars?

9. An empty car weighs 22 tons and can carry a load of 38 tons; what is the weight of the loaded car?

10. Of the 29 street-cars in a station in the morning 17 are taken out for service; how many are left in the station?

11. If there are 20 passengers in one car, 30 in another, and 27 in another, how many are there in all?

12. From a street-car having 66 passengers 23 got off; how many remained on the car?

Laura has read 29 pages of an 82-page book. How many pages has she yet to read?

Find the difference between 82 pages and 29 pages.

$$\begin{array}{r} 80 + 2 \text{ or } 82 \\ 20 + 9 \text{ or } 29 \\ \hline 50 + 3 \text{ or } 53 \end{array}$$

Test: $53 + 29 = 82$.

One can not think of 9 units and any units that make 2 units, so one thinks "9 units and 3 units are 12 units" and writes 3 in units' place. Then, "1 ten and 2 tens and 5 tens are 8 tens" and writes 5 in tens' place. Laura has 53 pages left to read.

1. Frank has read 63 pages of a book and Jennie 38. How many pages more has Frank read than Jennie?

2. A man worked 52 hours one week and a boy 37 hours. How many hours more did the man work?

3. When 29 pupils of a class of 47 are at the blackboard, how many pupils are at their seats?

Subtract and test by addition:

4. 60 − 22	5. 70 − 32	6. 30 − 12	7. 40 − 24
8. 80 − 75	9. 65 − 46	10. 87 − 49	11. 70 − 27
12. 55 − 36	13. 80 − 65	14. 83 − 64	15. 35 − 18
16. 90 − 35	17. 98 − 56	18. 67 − 29	19. 72 − 48

NOTE.—The teacher will add as many such exercises as circumstances require.

Written.

1. What is the cost of:

3 bars of soap at 5 cents a bar..... 15 cents
2 pounds of crackers at 8 cents a pound..... 16 "
5 pounds of sugar at 5 cents a pound..... 25 "
( ) cents

2. What is the cost of:

½ bushel of potatoes at 60 cents a bushel..... 30 cents
1 sack of salt at 10 cents..... 10 "
1 package of yeast-cakes at 8 cents..... 8 "
( ) cents

3. What is the cost of 3 pounds of lard at 8 cents a pound and a sack of flour at 55 cents?

4. A customer bought:

2 pounds of dried beef at 14 cents a pound... 28 cents
2 loaves of bread at 8 cents a loaf..... 16 "
2 boxes of strawberries at 10 cents a box..... 20 "
( ) cents

He paid 1 dollar; what change did he receive?

5. What did Carl pay for 4 qt. of berries at 10 cents a quart and 1 pound of butter at 19 cents?

6. What change had he left out of 75 cents?

7. Eva bought a pound of 55-cent tea and gave the grocer 1 dollar; how much change did he return?

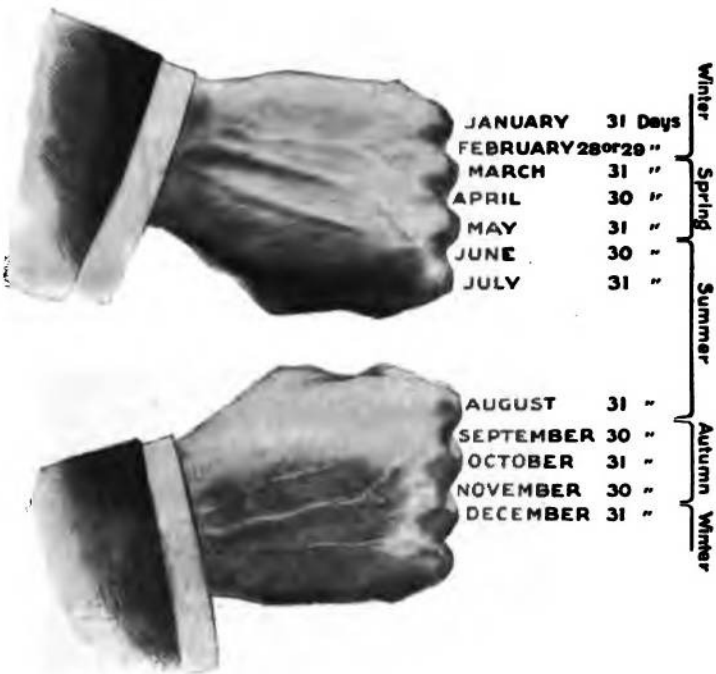
8. What is the cost of 2 dozen eggs at 18 cents a dozen and 2 packages of cereal at 12 cents each?

9. What is left from 50 cents after paying for:

3 loaves of bread at 5 cents a loaf,
1 dozen cookies at 10 cents,
1 dozen doughnuts at 10 cents?

10. Solve 6 other problems about the grocery.

Oral.



1. Read in the picture the months in the year and the number of days in each.
2. Name those that are opposite the knuckles.
3. How many days has each of these months?
4. Name those between the knuckles.
5. How many days in each except February?
6. What is the shortest month in the year?

Every 4th year (with certain exceptions) February has 29 days. These are called **leap years.** 1904 was a leap year.

7. Name the next leap year.
8. Make problems about months and seasons.

Oral. State the sums:

1.	1	1	1	1	1	1	1	1	1
	1	2	3	4	5	6	7	8	9
2.	2	2	2	2	2	2	2	2	2
	1	2	3	4	5	6	7	8	9

3. Write similar tables, having 3, 4, 5, 6, 7, 8, and 9 each in turn as the upper number.

4. State the sums, first in order from left to right, then irregularly. Keep up this practise until any of the sums can be stated instantly.

State the number which must be added to the lower number to produce the upper:

5.	10	10	10	10	10	10	10	10	10	10
	10	9	8	7	6	5	4	3	2	1
6.		9	9	9	9	9	9	9	9	9
		9	8	7	6	5	4	3	2	1
7.			8	8	8	8	8	8	8	8
			8	7	6	5	4	3	2	1

8. Write these and similar tables on the board having 7, 6, 5, 4 in turn as the upper number throughout one line. State the number which must be added to the lower number, first taking the problems in regular order, then irregularly. Practise as in Exercise 4.

Oral. Add the numbers in each column, first from the bottom upward, second from the top downward:

1. 4	2. 4	3. 6	4. 3	5. 1	6. 8	7. 1
2	8	8	4	2	4	7
3	7	7	2	3	5	6
8. 7	9. 3	10. 4	11. 8	12. 6	13. 1	14. 8
8	9	7	6	7	8	9
7	6	9	8	9	5	6
15. 9	16. 8	17. 7	18. 5	19. 6	20. 4	21. 7
9	8	7	5	6	4	7
9	8	7	5	6	4	8
9	8	7	5	6	4	8
22. 4	23. 3	24. 6	25. 9	26. 8	27. 7	28. 5
3	3	1	9	4	8	5
4	3	5	9	2	9	7
3	3	6	9	6	3	1

Read and supply blanks:

29. 1+1=—.	30. 2+1=—.	31. 3+1=—.
1+2=—.	2+2=—.	3+2=—.
1+3=—.	2+3=—.	3+3=—.
1+4=—.	2+4=—.	3+4=—.
1+5=—.	2+5=—.	3+5=—.
1+6=—.	2+6=—.	3+6=—.
1+7=—.	2+7=—.	3+7=—.
1+8=—.	2+8=—.	3+8=—.
1+9=—.	2+9=—.	3+9=—.

32. Write similar tables, beginning with 4, 5, . . . 9.

1. 1 ft. = — in. 1 yd. = — ft. 1 sq. yd. = — sq. ft.

2. 10 dimes = — nickels. 10 dimes = — cents. 10 nickels = — cents.

3. 1 qt. = — pt. 1 gal. = — qt. 1 gal. = — pt.

4. A square has — sides. A rectangle has — sides. A triangle has — sides. A cube has — faces.

5. 6 = — 3s. 12 = — 3s. 9 = — 3s.

6. 12 = — 4s. 8 = — 4s. 20 = — 4s.

7. 10 = — 5s. 20 = — 5s. 15 = — 5s.

8. For how many units does 1 in tens' place stand? 2 in tens' place? 5 in tens' place? 6? 8? 9?

9. How long is a rectangle that is 3 inches wide and contains 12 square inches?

10. How long is the side of a square that contains 9 square inches?

11. How many cents in 8 dimes? In 5 dimes? 4 dimes? 6 dimes? 10 dimes?

12. A man pays 15 dollars for an overcoat, 16 dollars for a suit of clothes, and 3 dollars for a hat. How much does he pay for all?

13. What is the cost of 1 gallon of milk at 4 cents a quart? Of $1\frac{1}{2}$ gallons?

14. How many square inches are there in the surface of a 2-inch cube?

15. If the distance around a triangle of equal sides is 12 in., what is the length of each side?

16. If the distance around a square is 16 in., what is the length of a side?

17. Make and solve 3 similar problems.

1. $\frac{1}{2}$ of 10 = —. $\frac{1}{2}$ of 100 = —. $\frac{1}{2}$ of 20 = —.

2. $\frac{1}{2}$ of 4 = —. $\frac{1}{2}$ of 40 = —. $\frac{1}{2}$ of 60 = —.

3. $\frac{1}{3}$ of 3 = —. $\frac{1}{3}$ of 30 = —. $\frac{1}{3}$ of 60 = —.

4. How many school-days are there in 4 weeks? Walter was absent $\frac{1}{5}$ of the time; how many days did he attend school?

Add:

5. 63 35	6. 18 75	7. 86 14	8. 27 35
9. 28 39	10. 69 26	11. 39 47	12. 41 58

Subtract:

13. 96 43	14. 81 56	15. 75 39	16. 60 39
17. 75 56	18. 89 49	19. 67 40	20. 99 77

21. How many days are there in July? In August? In September? In these three months?

22. How many days from January 1 to April 1 in 1904, counting January 1 but not April 1?

23. How many days from Washington's Birthday until the Fourth of July in 1905?

24. Make two marks on the blackboard $\frac{2}{3}$ of a yard apart as nearly as you can judge. Make two marks $\frac{1}{2}$ of a yard apart; $\frac{1}{3}$ of a yard apart. Test your estimate in each case by measurement.

MULTIPLES AND FRACTIONS

Counting in Groups

For class drill in counting:

1. One pupil may read the printed numbers and another may fill in the number names for the blanks.

1 ○ 3 ○ 5 ○ 7 ○ 9 ○ 11 ○ 13 ○ 15 ○ 17 ○ 19 ○

The second pupil may repeat his part alone.

2. One pupil may read the printed numbers and another may fill in the number names for the blanks.

1 2 ○ 4 5 ○ 7 8 ○ 10 11 ○ 13 14 ○ 16 17 ○

The second pupil may repeat his part alone.

Read the number names for the blanks in:

3. 2 ○ 4 ○ 6 ○ 8 ○ 10 ○ 12 ○ 14 ○ 16 ○

4. 1 2 3 ○ 5 6 7 ○ 9 10 11 ○ 13 14 15 ○

5. 1 ○ 3 4 ○ 6 7 ○ 9 10 ○ 12 13 ○ 15 16 ○

6. Count by 3s from 2 to 20. Thus, 2, 5, 8, etc.

7. Count by 5s from 5 to 50; by 7s from 3 to 50.

8. Write the numbers from 1 to 60, omitting every sixth number beginning with 6. Read the numbers omitted.

9. Write the numbers from 1 to 70, omitting every seventh number beginning with 7. Read the numbers omitted.

10. Write the numbers to 80, and omit every eighth number beginning with 8. Read the numbers omitted.

Material: Rectangular pieces of paper 4 in. by 2 in.

1. Fold a rectangular piece of paper 4 in. long and 2 in. wide so as to bring the two short edges together. What is the shape of the folded paper? The size?

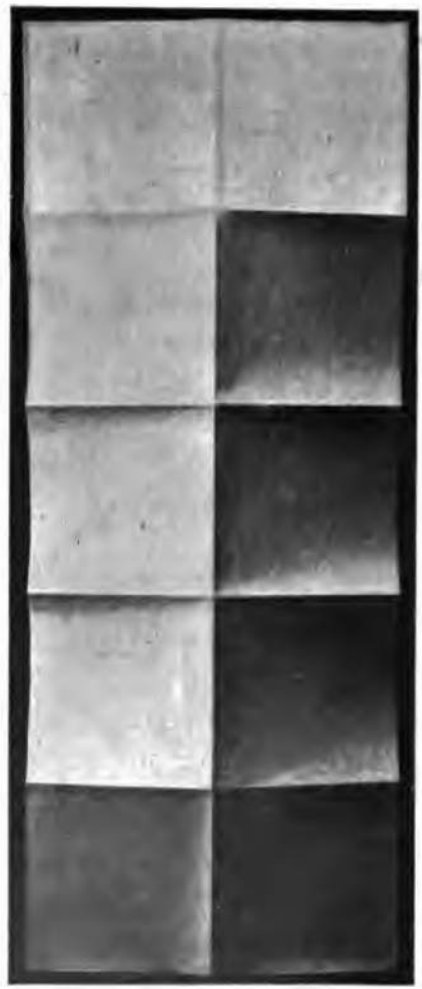
2. Fold once more each way. What is the shape of the folded paper? The size? Open the paper.

3. Into how many parts do the creases divide the rectangle? What is the shape of the parts? The size?

4. 2 times 4 squares = — squares.
   $\frac{1}{2}$ of 8 squares = —.

5. 4 times 2 squares = — squares.
   $\frac{1}{4}$ of 8 squares = —.

6. Show $\frac{1}{4}$ of the paper; $\frac{3}{4}$ of it; $\frac{1}{2}$ of 6 squares.



1. What is the size of each square in the picture?

2. What is the shape of this paper?

3. How many squares are there in each column?

4. How many squares in all?

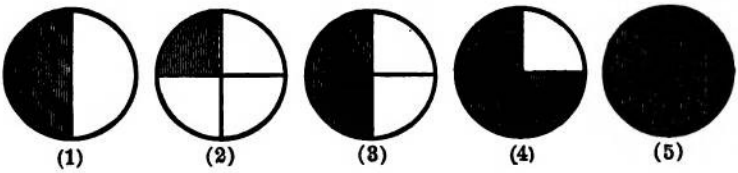
5. How many squares are there in each row?

6. How many squares are there in 3 rows? In 5 rows?

7. To fold a rectangular piece of paper 2 in. by 5 in. like the figure: Draw a line 1 in. from a short side. Fold on this line, then fold over and over to the end. Fold this once more, bringing its short edges together. Open.

8. Find 2 times 2; 3 times 2; 4 times 2; 5 times 2. The symbol for **times** is $\times$. Thus, $2 \times 2 = 4$.

2, 4, 6, . . . are called **multiples** of 2.



Oral.

1. Into how many equal parts is Figure 1 divided? What part of the circle is each called?

2. How many halves are there in any quantity? What are the halves of 4 quarts? 2 is what part of 4?

3. What are the halves of 6 feet? How many threes are there in 6? 3 is what part of 6?

4. How many fours are there in 8? 4 is — of 8?

5. One-half of 10 is what number? $\frac{1}{2}$ of 16 = —.

6. Into how many equal parts is Figure 2 divided? What part of the circle is each called?

7. How many fourths are there in any quantity? What are the 4 fourths of 8 quarts? 2 is what part of 8? How many threes in 12? 3 is what part of 12?

8. How many fives are there in 20? 5 is what part of 20?

9. What part of Figure 3 is shaded? How many fourths does this part contain? How many fourths in any quantity? Which figure shows four-fourths shaded?

10. One-fourth of a quantity is what part of one-half of it? One-fourth and one-fourth is what part of the whole?

11. How many fourths of Figure 4 are shaded? One-half and one-fourth is what part of the whole?

1. How many 2-cent newspapers cost as much as a 10-cent magazine?

2. How many 1-cent papers cost as much as 10 two-cent papers?

3. A news-dealer allowed $\frac{1}{2}$ of the receipts for selling. A boy sold 8 two-cent papers; how much money did he receive for his work?

4. Mark bought 20 two-cent papers for 20 cents. He sold 10 and gave another boy 5 cents for selling the rest. How much did Mark make?

5. A news-agent sells 9 two-cent papers and 2 five-cent papers on one car; how much does he receive?

6. If a newspaper sells for 2 cents, for how much will 8 newspapers sell? 10 newspapers? 6? 4? 5? 12?

7. A boy sells 12 newspapers for 2 cents each and gets $\frac{1}{2}$ of the money for his work; how many cents does he receive?

8. Henry sold 8 two-cent papers one day, 6 the next, and 10 the next; how many did he sell in the three days? How many cents did he receive?

9. Roy sold 5 two-cent papers each day for a week; how much did he receive in all?

10. If a boy buys 50 newspapers for 50 cents and sells them for 2 cents each, how much does he gain?

11. If a boy makes 2 cents by selling 1 paper, how much will he make by selling 50 papers? 30 papers?

12. Make and solve 5 similar problems.

13. How many twos in 20? In 18? In 16? In 10?

1. How many groups of 3 windows in each story above the first as shown in the picture?

2. How many windows are there in 2 of these groups?

2×3 windows = — windows.

3. How many windows in 3 of these groups?

3×3 windows = — windows.

4. How many windows in 4 groups? In 5 groups? In 6 groups?

5. 7×3 windows = — windows.
10×3 windows = — windows.

6. The front of the building is in 2 sections. How many windows in each story for each section? How many windows in a whole section?

7. How many panes of glass in each window? How many in all the windows of a section?

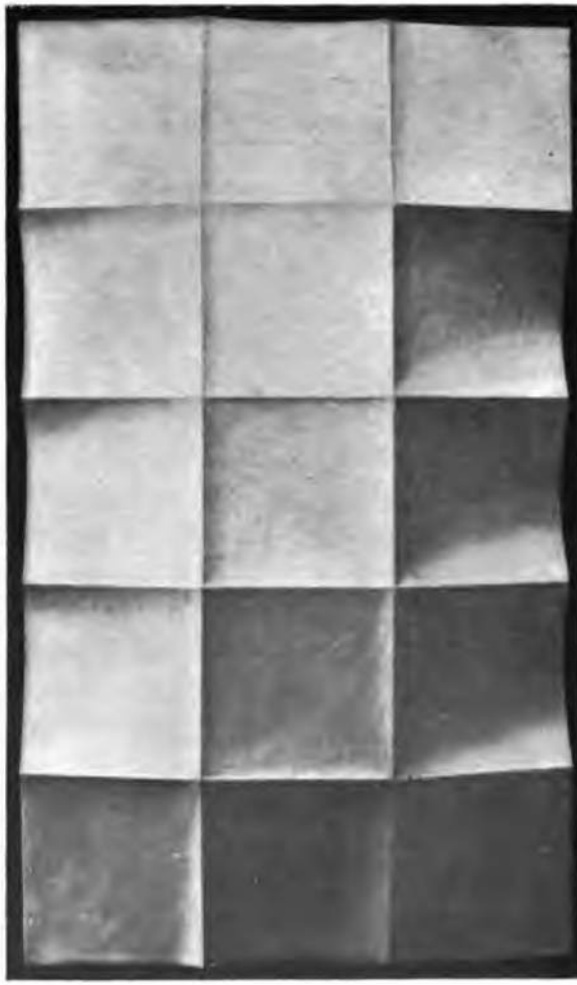
8. 3 and 3 = —$\times3$; 3 and 3 and 3 = —$\times3$.

9. 4×3 = —. 5×3 = —. 8×3 = —.
7×3 = —. 9×3 = —. 10×3 = —.

10. Place 3 rows of 10 dots each in the form of a rectangle. Point out 2×3, 3×3, 5×3, 7×3, 9×3, 6×3, 4×3, and 10×3.

3, 6, 9, . . . are called **multiples** of 3, since $1\times3=3$, $2\times3=6$, $3\times3=9$, and so on.

11. Form a table of the multiples of 3 from 2×3 to 10×3 and learn them.



1. What is the shape of the paper in the picture on the opposite page?

2. How many squares are there in each column? How many are there in each row?

3. What is the length of the rectangle? The width?

4. How many squares are there in the whole rectangle? What is the size of each square?

5. How many square inches are there in the top row? In each row?

6. How many square inches are there in 2 rows? In 4 rows? In 5 rows? In 3 rows?

7. 2×3 squares = — squares.
   3×3 squares = — squares.
   5×3 squares = — squares.

8. Fold a rectangular piece of paper 3 inches by 10 inches into 1-inch squares. In folding the short lines, fold from each end until the folded parts come together. From this figure find how many are 2 times 3, 3 times 3, 5 times 3, 7 times 3, 10 times 3, 8 times 3.

9. Find $\frac{1}{3}$ of 18; $\frac{2}{3}$ of 18; $\frac{1}{6}$ of 18; $\frac{5}{6}$ of 18; $\frac{1}{3}$ of 30; $\frac{2}{3}$ of 30; $\frac{1}{6}$ of 30; $\frac{5}{6}$ of 30; $\frac{1}{2}$ of 30.

10. Make 3 rows of 10 dots each. Cover $\frac{1}{2}$ of them. How many are uncovered? Cover $\frac{1}{3}$ of them. How many are uncovered? What number is $\frac{2}{3}$ of 30?

11. Find in the same way $\frac{1}{6}$ of 30; $\frac{1}{5}$ of 30; $\frac{5}{6}$ of 30; $\frac{2}{5}$ of 30; $\frac{3}{5}$ of 30; $\frac{5}{6}$ of 30.

12. How many 3-cent newspapers can be bought for 30 cents? For 15 cents? For 21 cents?

Oral.

1. Into how many equal parts is Figure 1 divided?

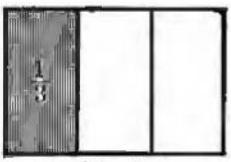


Fig. 1

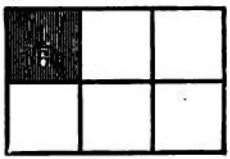


Fig. 2

2. What is one of the three equal parts of any quantity called? What are the 3 equal parts of 9 feet? 3 is what part of 9?

3. $3\times4=$—. What is $\frac{1}{3}$ of 12? $3\times6=$—. What is $\frac{1}{3}$ of 18? What is $\frac{1}{3}$ of 24?

4. How many thirds of Figure 1 are there in the parts not shaded?

5. How many feet in $\frac{2}{3}$ of a yard? In $\frac{1}{3}$ of 2 yards?

6. $\frac{2}{3}$ of 6=—. $\frac{2}{3}$ of 18=—. $\frac{2}{3}$ of 24=—.

7. Into how many equal parts is Figure 2 divided? What is one of the six equal parts of a quantity called? 3 days are what part of 18 days?

Written.

8. Draw a line 12 inches long, mark off $\frac{1}{6}$ of it. 4 in. are — sixths of 12 in. 4 in. are — third of 12 in.

9. Draw a line 24 inches long. Mark it off into 6 equal parts. How many inches in $\frac{1}{6}$ of 24 in.? In $\frac{3}{6}$ of 24 in.? In $\frac{1}{2}$ of 24 in.? In $\frac{5}{6}$ of 24 in.?

10. Divide a circle as nearly as you can into 6 equal parts by lines drawn from the center. Shade $\frac{1}{6}$ of the surface; another sixth. What part of the surface is shaded? How many sixths in $\frac{1}{3}$? What part of $\frac{1}{3}$ is $\frac{1}{6}$? Shade $\frac{2}{3}$ of the surface. $\frac{2}{3}$=— sixths.

Oral.

1. What is the cost of 3 bunches of celery at 3 cents a bunch?

2. How many bunches of celery at 3 cents a bunch can be bought for 15 cents? For 21 cents?

3. James bought 10 bunches of rhubarb for 2 cents a bunch and sold them for 5 cents a bunch; how much did he make?

4. When radishes cost 3 cents a bunch, how many cents do 8 bunches cost? 4 bunches? 5 bunches? 6 bunches? 10 bunches?

5. How many bunches of radishes at 3 cents a bunch can be bought for 15 cents? For 21 cents? 30 cents? 18 cents? 27 cents? 12 cents? 24 cents?

6. 8 bunches at 3 cents a bunch cost how much more than 9 bunches at 2 cents a bunch?

7. When radishes and rhubarb are each 3 cents a bunch, what is the cost of 5 bunches of radishes and 4 bunches of rhubarb?

8. Eugene buys 12 bunches of watercress at 2 cents a bunch and sells them at 3 cents a bunch; how much does he make?

9. With 30 cents how many more bunches of watercress can be bought at 2 cents a bunch than at 3 cents?

10. What is the cost of 3 bunches of onions at 2 cents a bunch and 2 bunches at 3 cents a bunch?

11. Name other things sold at the grocery store for 3 cents.

12. Make and solve 3 problems about these things.

1. Draw a circle and divide it into fourths. Shade $\frac{1}{2}$ of it; $\frac{3}{4}$ of it.

2. Draw a rectangle 2 feet long and $\frac{1}{4}$ of a foot wide. Divide it the short way into halves.

3. Divide it into fourths and shade every other one.

4. Draw a rectangle 1 foot long and half as wide. Divide it by a line drawn between opposite corners. Shade $\frac{1}{2}$ of the rectangle.

5. Draw a line 4 feet long. Divide it into fourths. Erase every other fourth. What part of the length of the whole line have you erased? What part is left?

Oral.

6. A kite string 60 feet long broke 30 feet from the kite, and — feet came down; what part of the string came down?

7. Lawrence had a kite string 20 yards long and James had one $\frac{1}{2}$ as long; James's kite string was — feet long.

8. Frank had a kite whose string was 50 feet long. He tied on another $\frac{1}{2}$ as long. The whole string was — feet long.

9. One kind of a flat kite costs 15 cents and a box kite costs 30 cents. The flat kite costs — as much as the box kite.

10. A flat kite 20 in. long and a box kite half as long are tied 60 in. apart on the same string; what is the total length of the kites and string?

11. Make and solve 3 other problems.

Oral.

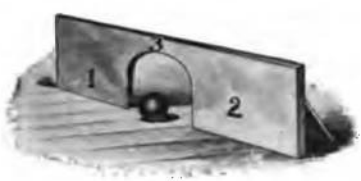
1. When marbles are selling at 3 for a cent, how many can be bought for 5 cents? For 8 cents? For 10 cents? For 6 cents?

2. How many more marbles can be bought for 7 cents when marbles are selling at 3 for a cent than when they are selling at 2 for a cent?

3. How much do 5 alleys cost at 3 cents each?

4. How many clay marbles selling at 3 for a cent are worth as much as two 3-cent alleys?

5. When the marble rolls through the arch, as in the picture, the player counts a gain of 3; when it strikes the right side he counts a loss of 2; when it strikes the left side he counts a loss of 1. Ralph and John take turns at rolling the marble. In six trials Ralph rolls the marble through the arch twice, strikes the 1 three times and the 2 once. What is his count? John rolls the marble through the arch three times, hits the 1 twice, and the 2 once. What is his count? Who wins the game?



6. The numbers below indicate the counts in a game of 10 trials.

Charles, 2, 3, 1, 3, 2, 1, 3, 3, 3, 2.
Frank, 3, 3, 2, 2, 1, 3, 3, 2, 3, 3.

Who won the game and by how many counts?

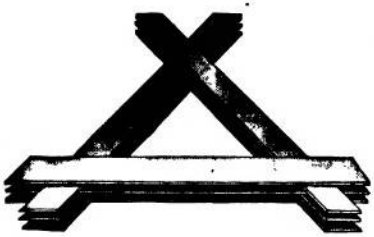
7. Make and solve three other problems for this game.

Oral.

1. How many feet are there in a yard? In 5 yd.? In 8 yd.? In 10 yd.? In 6 yd.? In 9 yd.?

2. How many feet wide is a street that is 10 yd. wide? 9 yd. wide?

3. How many feet deep is a trench 7 yd. deep?



4. In making this pile of boards 3 boards were used each time around; how many boards would be used in going around 5 times? 6 times? 10 times? 9 times? 7 times?

5. When calico is 3 cents a yard, how many yards can be bought for 12 cents? 30 cents? 18 cents?

6. Name other things that are sold at the dry-goods stores for 3 cents a yard. What will 5 yd. cost? 4 yd.? 8 yd.? 10 yd.? 9 yd.? 7 yd.?

7. When 8 bunches of braid cost 24 cents, what does 1 bunch cost? 6 bunches? 10 bunches?

8. When 4 yd. of ribbon cost 12 cents, what does 1 yd. cost? 5 yd.? 8 yd.?

9. When 6 skeins of silk cost 18 cents, what does 1 skein cost? 7 skeins? 9 skeins?

10. When a dozen buttons cost 18 cents, what does $\frac{1}{2}$ of a dozen cost? $\frac{1}{6}$ of a dozen? $\frac{5}{6}$ of a dozen?

11. When 10 yd. of lace cost 30 cents, what does 1 yd. cost?

12. Make and solve five similar problems.

1. Write the numbers from 1 to 43. Erase 2 and 3; keep 4. Erase 5 and 6; keep 7. Continue this to the end. How much greater is each remaining number than the one preceding it? Read these numbers.

2. Count by threes from 1 to 43; from 2 to 35.

3. Count by twos from 2 to 32; from 1 to 25.

4. $\frac{1}{2}$ of 20 = —. $\frac{1}{3}$ of 30 = —. $\frac{2}{3}$ of 30 = —.

5. $\frac{1}{2}$ of 60 = —. $\frac{1}{3}$ of 60 = —. $\frac{2}{3}$ of 60 = —.

6. $\frac{1}{2}$ of 40 = —. $\frac{1}{4}$ of 40 = —. $\frac{3}{4}$ of 40 = —.

7. $\frac{1}{2}$ of 80 = —. $\frac{1}{4}$ of 80 = —. $\frac{3}{4}$ of 80 = —.

8. $\frac{1}{2}$ equals how many fourths? $\frac{1}{2}$ and $\frac{1}{4}$ equal how many fourths?

9. Fold a piece of paper 2 inches by 6 inches into 1-inch squares. From the creased paper find $\frac{1}{2}$ of 12, $\frac{1}{3}$ of 12, $\frac{2}{3}$ of 12, $\frac{1}{4}$ of 12, $\frac{3}{4}$ of 12.

10. 3×3 square feet = — square feet. How many square feet in a 3-foot square? What is such a square called?

11. Count by threes to 30; from 30 to 60. How many times 3 are 33? 36? 45? 60?

12. How many more twos are there in 16 than in 8?

13. How many more threes are there in 21 than in 15?

14. How many more twos are there in 30 than in 20?

15. How many more threes are there in 27 than in 18?

16. How many more twos are there in 28 than in 16? In 24 than in 8?

1. How many rows in the camp? If one tent is taken from each row, how many tents are taken? If two tents are taken from each row, how many are taken?

4×2 tents = — tents. 2×4 tents = — tents.

2. If three tents are taken from each row, how many are taken?

4×3 tents = — tents. 3×4 tents = — tents.
4×4 tents = — tents. 6×4 tents = — tents.
7×4 tents = — tents. 10×4 tents = — tents.

3. If there are 4 soldiers in each tent, how many soldiers are there in 2 tents? In 3 tents? In 4 tents? In 5 tents? In 10 tents? In 8? In 7? In 6?

4. How many tents are there in each of the long rows? How many of these rows are there?

4×10 tents = — tents. 10×4 tents = — tents.

5. Count by fours from 4 to 40; from 40 to 100.

6. 4 and 4 = — $\times 4$. 4 and 4 and 4 = — $\times 4$.

7. $2 \times 4 =$ —. $3 \times 4 =$ —. Form a table of the multiples of 4 to 10×4 and learn them.

Oral.

1. How many shoes are needed to shoe 1 horse? 2 horses? 5? 8? 10? 7? 4? 6?

2. If 4 nails are used on each side of a shoe, how many nails are used for 1 shoe? For 2? 3? 4?

3. How many nails are used in shoeing 2 horses?

4. If it costs 25 cents ($\frac{1}{4}$ of a dollar) to shoe 1 foot of a horse, what does it cost to shoe the horse?

5. A blacksmith shod 2 teams in one forenoon. How much did he earn at 25 cents a shoe?

6. If a horseshoe costs 10 cents, what is the cost of shoes enough for one horse?

7. What does it cost to have a team shod?

8. What is the cost of 4 pounds of horseshoe nails at 10 cents a pound?

9. What is the cost of shoeing the fore feet of a horse at 25 cents a shoe and 4 shoes at 10 cents each?

10. In Exc. 9, what is the change from a dollar?

11. How many wheels has a wagon? 3 wagons? 5? 4? 8? 6? 10?

12. How many tires on the 4 wheels of a wagon?

13. If it costs 50 cents to set a tire, what does it cost to set all of the tires on a wagon?

14. An iron bar 4 ft. long costing 30 cents is made into 6-inch bolts; how many bolts in 1 bar?

15. The bolts sell at 10 cents each; what is the profit from one bar?

16. How much is earned by making 2 such bars into bolts? 4 such bars?

The bushel is a unit of measurement for grain. When grain is carried to market in small quantities, it is carried in bags containing two bushels each.

1. How many bushels will 2 such bags hold? 3 bags? 6 bags? 5 bags? 8 bags? 10 bags?

2. How many times will the grain from a 2-bushel bag fill a bushel measure? The grain from 3 bags? From 8 bags? From 10 bags? From 18 bags?

3. How many bags are there in the pile shown in the picture? How many bushels?

4. How many bushels are there in $\frac{1}{2}$ of the pile? In $\frac{1}{4}$ of it? In $\frac{3}{4}$ of it?

Material: Sawdust or grain, a peck and a half-bushel measure

1. Fill the peck measure with sawdust and pour the contents into the half-bushel measure. Fill the half-bushel measure in this way. How many pecks of sawdust in a half-bushel?

2. How many half-bushels in a bushel? How many pecks of sawdust would it take to fill a bushel measure?

3. A grocer sold a bushel of potatoes, giving one peck to each customer. How many customers were supplied?

4. How many pecks of tomatoes in 2 bushels of tomatoes? In $2\frac{1}{2}$ bushels? In 3 bushels? In 5 bushels? In 8 bushels? In 7 bushels?

Written.

1. 45+45=—. $\frac{1}{2}$ of 90=—. What is the cost of $\frac{1}{2}$ of a gallon of 90-cent sirup and a gallon of 54-cent molasses?

2. From a cask containing 65 gal. of molasses 39 gal. are drawn; how many gallons remain in the cask?

3. 60=— ×30. 60=— ×15. When molasses is 60 cents a gallon, how much is it a quart?

4. A cask of kerosene contains 40 gallons. After 30 gallons are drawn out, how many quarts remain in the cask?

5. A grocer had on hand 95 gal. of kerosene in the morning. During the day he sold 56 gal.; how many gallons had he at night?

6. The number of gallons of vinegar in three kegs is 80; the number of gallons in the first two is 51; how many gallons in the third?

7. A crate of berries contains 16 qt. How many quarts are there in 2 such crates? In 3?

8. A grocer bought 96 qt. of berries and sold 64 qt. How many had he left?

9. What is the cost of 8 qt. of berries at 4 cents a quart and 10 pounds of sugar at 4 cents a pound?

10. When 6 qt. of currants cost 24 cents, what is the cost of 1 qt.? Of 7 qt.? Of 9 qt.? Of 8 qt.?

11. How many fours in 20? How many gallons in 20 qt.? How many gallons in 40 qt.? In 80 qt.?

12. How many bushels are there in 8 pecks of onions? In 16 pecks? In 40 pecks?

Written.

1. Clarence bought 9 oranges at 3 cents each and 8 lemons at 3 cents each; how many cents did he pay for both? How much change had he left out of 75 cents?

2. If 4 oranges are used for breakfast every morning, how many days will 1 dozen last? When oranges are 3 cents each, what is the cost of $\frac{2}{3}$ of a dozen?

3. What is the cost of $\frac{3}{4}$ of a dozen at the same rate? What is the cost of 2 dozen and $\frac{1}{4}$ of a dozen?

4. When bananas are 3 cents each, what is the cost of $\frac{2}{3}$ of a dozen? What is the cost of 10 bananas?

5. When bananas are 1 cent each, how many can be bought for 15 cents? When they are 3 cents each, how many can be bought for 15 cents?

6. What is the cost of 8 one-cent bananas and 12 three-cent bananas?

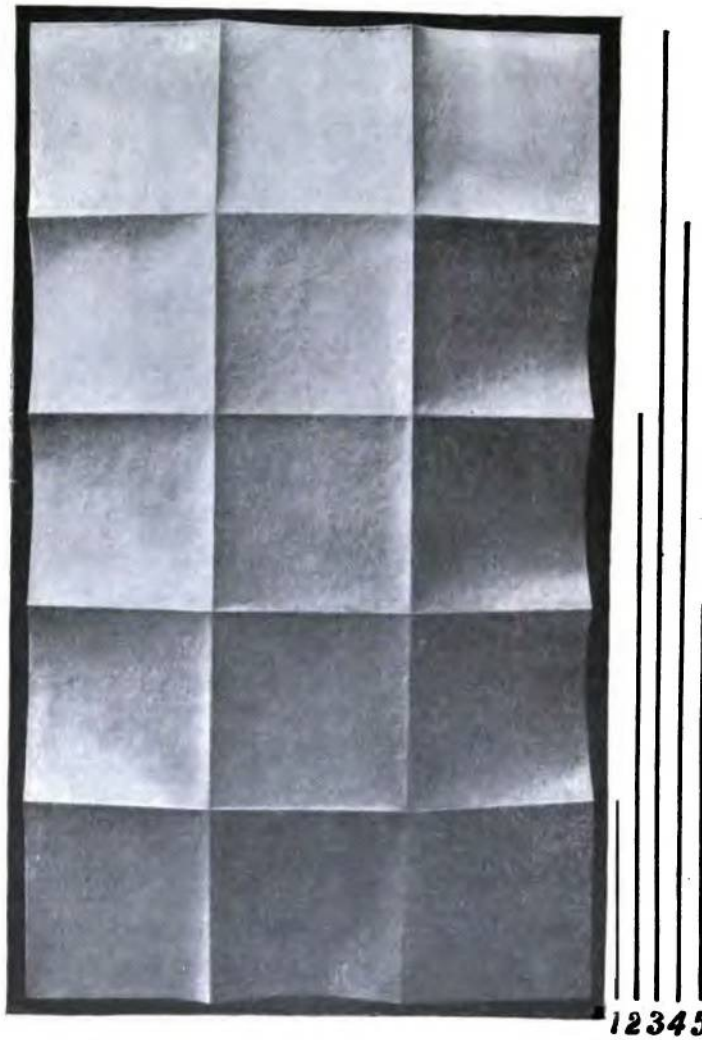
7. Henry bought 6 quarts of peanuts at the rate of 3 cents a pint; how much did they cost him? He sold them for 5 cents a pint; how much did he make on the 6 quarts?

8. Charles bought 2 dozen pop-corn balls at 3 cents a ball; how much did they cost him? He gave the clerk 1 dollar; what change did he receive?

9. He sold the pop-corn at 5 cents a ball; how much did he make on a ball? On the 2 dozen balls?

10. When grapes are 15 cents a pound, how many pounds can be bought for 40 cents? What is the change from $\frac{3}{4}$ of a dollar?

11. What other things are sold at a fruit-stand? State their prices and make problems about them.


12345

1. What is the length of the rectangle on the opposite page? What is its width?

2. How many columns of 5 squares does it contain? One column is what part of its area? Two columns are what part of its area?

3. How many rows are there in the rectangle? How many squares are there in 2 rows? In $\frac{2}{5}$ of the figure? In $\frac{4}{5}$ of the figure?

4. Fold a piece of paper 5 inches by 10 inches into inch squares. How many squares are there in one of the longer rows? How many such rows of squares are there? How many squares in the whole rectangle?

5. How many squares are there in 2 of the short rows? In 3 of these rows? In 6? In 9? In 7? In 5? In 10?

6. How many such rows are there in $\frac{1}{5}$ of the rectangle? In $\frac{3}{5}$ of it? In $\frac{2}{5}$ of it? In $\frac{4}{5}$ of it?

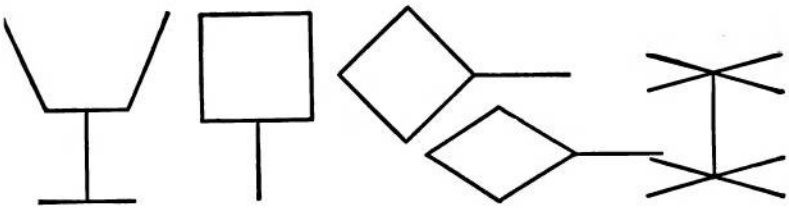
7. How many short rows contain as many squares as a long row? As 2 long rows? As 4? As 5?

8. Show from the rectangle that 3 fives make fifteen; that 4 fives make 20; that 8 fives make 40.

9. If the first line on the opposite page stands for 5, find a line that stands for 10; for 20; for 15; for 25.

10. Select a pair of lines, one of which is twice as long as the other; one of which is $\frac{2}{3}$ of the length of the other; one of which is 3 times as long as the other.

11. How should the lines be arranged to stand for the numbers 5, 10, 15, 20, 25 in order?



1. How many lines in each of these figures?

2. How many lines in two of the figures? In 3 of them? In 4 of them? In 5 of them?

3. 5 lines and 5 lines, or 2×5 lines = — lines.

4. 3×5 lines = — lines. 4×5 lines = — lines.

5. 5×5 = —. 7×5 = —. 6×5 = —.

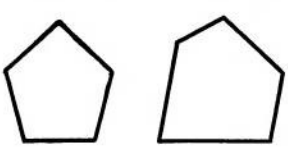
6. 9×5 = —. 8×5 = —. 10×5 = —.

7. Make 10 rows of 5 dots each. How many dots are there in 2 rows? 2×5 dots = — dots.
3×5 dots = — dots. 4×5 dots = — dots.
8×5 dots = — dots. 10×5 dots = — dots.

8. Count by fives to 100 and write the numbers as you count.

9. How many fives are there in 45? In 35? In 20? In 15? In 50?

10. 5 is what part of 10? Of 20? 15 is — of 20.



11. How many sides has each figure? A figure of 5 sides is called a **pentagon**. How many sides have 2 pentagons? 3 pentagons? 5 pentagons?

12. 2×5 = —. 3×5 = —. Form a table of the multiples of 5 to 10×5 and learn them.

1. How many 5-cent pieces in the rack shown in the picture? How many dimes? How many cents?

2. How many 1-cent pieces does the rack hold? How many 5-cent pieces? If 2 dimes are as thick as 1 nickel, how many dimes does the rack hold?

3. How many nickels is 1 dime worth? 2 dimes? 4 dimes? 6 dimes? 5? 8? 7? 10? 9?

4. If 6 five-cent pieces are taken out of the rack, how many dimes may be put in to make up the amount? How many dimes will make up for 8 five-cent pieces? For 4? For 10? For 16? For 18?

5. How many cents is a 5-cent piece worth? 2 five-cent pieces? 3? 6? 8? 4? 7? 10? 5?

6. If 10 cents are taken from the rack, how many 5-cent pieces may be put in to make up the amount? How many 5-cent pieces will make up for 15 cents? For 25 cents? For 20 cents?

7. The cent column twice full is worth how many cents? How many 5-cent pieces? How many dimes?

Written.

1. George bought 15 qt. of berries at 4 cents a qt. and sold them at 5 cents a qt.; how much did he gain? What is the shortest way to find this?

WAYS TO EARN MONEY

25¢ for mowing a lawn.	25¢ for weeding a garden-bed.
5¢ for tending a furnace.	15¢ for cleaning a walk.
10¢ for blacking a pair of shoes.	5¢ for running an errand.
10¢ for washing the dishes.	(¢ stands for cents.)

2. How much does a boy earn who mows a lawn once and weeds a garden-bed 3 times?

3. A boy mowed a lawn 5 times and weeded a garden-bed twice in a month; how much did he earn?

4. Roy tends a furnace twice each day; how much does he earn in a week? In two weeks?

5. What is it worth to tend a furnace twice a day for 2 weeks and to clean a walk 4 times?

6. James blacked shoes; how much did he receive from 20 customers?

7. Mary runs 7 errands in a week and washes the dishes 9 times; how much does she earn?

8. Julia bought 6 dolls at 5 cents each and 1 yd. of muslin for 15 cents. She paid — cents for these.

9. She dressed the dolls and sold them for 15 cents each; how much did 2 dolls bring? 4? 6?

10. How much did Julia make?

11. Lucy bought 3 pounds of sugar at 5 cents a pound, 1 quart of milk for 5 cents, and other things for 10 cents. They all cost — cents.

1. 10 five-cent pieces are rolled in a package. How many cents is the package worth? What part of a dollar?

2. How many such packages are worth $2\frac{1}{2}$ dollars? 5 dollars? 10 dollars?

3. If 1-cent pieces are rolled in packages of 25 each, how many 5-cent pieces does a package equal in value? How many 5-cent pieces do 3 such packages equal in value? 4 packages?

4. 4 packages of 25 1-cent pieces are equal in value to how many dollars? 8 packages are equal in value to how many dollars?

5. If dimes are rolled in packages of 20 each, how many dimes are there in $\frac{1}{2}$ of a package? In $\frac{1}{4}$ of a package? In $\frac{3}{4}$ of a package?

6. How many 5-cent pieces is a package of 20 dimes worth? $\frac{1}{2}$ of such a package? $\frac{3}{4}$ of it?

7. How many quarters are there in a dollar? How many dollars are there in a package of 20 quarters? How many dollars are there in 4 such packages?

8. How many dollars is a package of 20 dimes worth? A package of 20 quarters? A package of 10 five-cent pieces?

9. 8 packages of 10 five-cent pieces each are worth how much less than 4 packages of 10 quarters each?

10. A package of quarters is worth 10 dollars; how many quarters in the package?

Material: Clock-face with movable hands

1. I on the clock-face stands for **one**. II stands for **two**. What does III stand for? IIII?

2. Beginning with I, point to the numbers on the clock-face in order and count from 1 to 12.

3. Which number on the clock-face stands for 5? For 6? For 8? For 12? 10? 9? 7? 11?

4. What time of day does the clock in the picture indicate? How many times each day is it 8 o'clock? How many hours before noon is 8 o'clock in the morning?

5. When the hour-hand points to III and the minute-hand to XII, what time is it?

6. How many hours between 9 o'clock in the forenoon (A. M.) and four o'clock in the afternoon (P. M.)?

7. Count by 5s to 60. Write the numbers as you count. How many 5s in 60?

8. Each full space between the adjacent figures on the clock-face is divided into 5 equal spaces called minute spaces. How many minute spaces are there in a full space? In 2? In 3? In 6? On the whole face?

Written.

1. Lucy made 5 pen-wipers for a Christmas sale, Charles made 6 table mats, Francis made 10 picture-frames, and Charlotte dressed 9 dolls; how many articles did these pupils furnish?

2. The materials for each pen-wiper cost 2 cents, and the pen-wipers sold for 5 cents each; how much was made on these articles?

3. The materials for each mat cost 3 cents, and the mats sold for 10 cents each; how much was made on the mats?

4. The materials for all of the picture-frames cost 15 cents, and the frames sold for 5 cents each; how much was made on the frames?

5. The dolls cost 3 cents each and were sold for 10 cents each; how much was made on the dolls?

6. How much was made on all of the articles furnished by these pupils?

7. On which kind of articles was the entire profit the greatest? The least?

8. If the pupils wish to buy a picture with the profits of their sale, and find that they lack 15 cents, what is the price of the picture?

9. The profit on the pen-wipers and picture-frames alone was what part of a dollar?

10. If it took a half-hour to make each picture-frame, how long did it take to make all of the frames?

11. If it took 2 hours to dress 1 doll, how long did it take to dress all of the dolls?

Read and supply the numbers for the blanks :

1. The distance around a square plot 10 yd. on a side is — yd.

2. The number of posts 2 yd. apart in a fence around this plot is —.

3. The number of yards of wire required to go twice around this plot is —.

4. $\frac{3}{4}$ of the distance around the plot is — yd.

5. A garden has 3 rows of berry bushes with 9 bushes in a row; there are — bushes.

6. The bushes are a yard apart and the nearest bushes are 1 yd. from the fence on all sides; the length of the garden is — yd. The width is — yd.

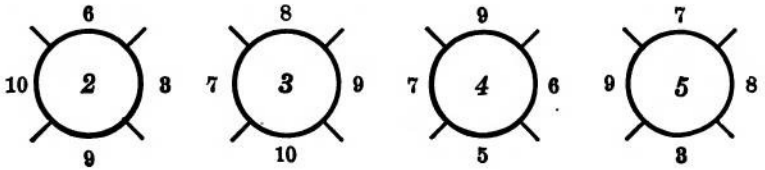
7. The number of yards in the fence around the garden is —.

8. The posts are 2 yd. apart. There are — posts in the fence.

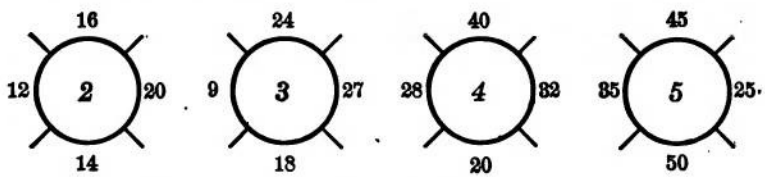
Copy and fill in the blanks :

9.	$8\times4=$—.	$8=$—$\times4$.	$5\times$—$=20$.
10.	$9\times4=$—.	$32=$—$\times4$.	$7\times$—$=28$.
11.	$7\times4=$—.	$12=$—$\times4$.	$4\times$—$=16$.
12.	$8\times3=$—.	$27=$—$\times3$.	$10\times$—$=30$.
13.	$10\times4=$—.	$32=$—$\times4$.	$10\times$—$=40$.
14.	$10\times3=$—.	$20=$—$\times2$.	$8\times$—$=32$.
15.	$24=$— 3s.	$18=$— 3s.	$21=$— 3s.
16.	$36=$— 4s.	$28=$— 4s.	$30=$— 3s.
17.	$27=$— 3s.	$32=$— 4s.	$15=$— 3s.

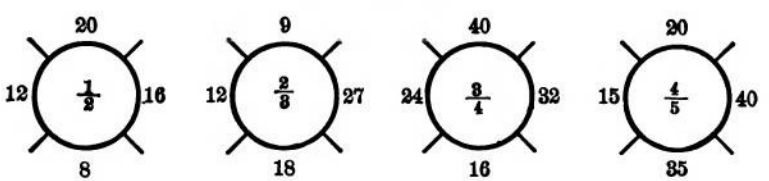
1. Multiply the numbers outside of each circle by the number in the circle.



2. Divide the numbers outside of each circle by the number in the circle. Thus, there are 6 *twos* in 12, 8 *twos* in 16, and so on.



3. Find the part of each number outside of the circle shown by the fraction in the circle.



Make other problems by changing the numbers outside of the circles in each exercise.

4. If one box of soap weighs 18 pounds and another weighs $\frac{1}{2}$ as much, what does the second box weigh?

5. There are 2 dozen and $\frac{3}{4}$ of a dozen bars of soap left in a box; how many bars are there?

1. How many nickels are worth 25 cents? How many are worth a half-dollar? A dollar?

2. How many packages of 25 one-cent pieces are worth 1 package of 10 ten-cent pieces?

3. What is the distance around a pentagon, if each side is 5 inches long?

4. How many times does the hour-hand pass around the clock-face in a day? How many hours are there in a day? In $\frac{1}{2}$ of a day? In $\frac{1}{4}$ of a day?

5. How many minute spaces does the minute-hand pass over in an hour? In $\frac{1}{2}$ of an hour? In $\frac{1}{4}$ of an hour? In $\frac{3}{4}$ of an hour?

6. To what figure does the minute-hand point at half past nine? At 15 minutes past nine? At 15 minutes to eleven?

7. When 6 bars of soap are sold for a quarter, what is the cost of 2 dozen bars?

8. When 4 bars of soap are sold for a quarter, what is the cost of 2 dozen bars?

9. A kite costs 40 cents and a string $\frac{1}{4}$ as much; how many cents do both cost?

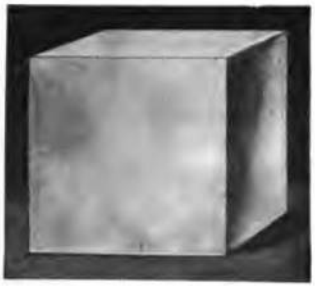
10. What is the cost of 12 quarts of peanuts at 2 cents a pint and a dozen bananas at 3 for 4 cents?

11. A rectangular garden is 12 yards long and 8 yards wide; how many yards around the garden? How many boards 4 yards long will reach around it? How many boards are needed for a fence 3 boards high?

12. $\frac{1}{2}$ of 16 = —. $\frac{1}{2}$ of 24 = —. $\frac{1}{2}$ of 40 = —.

13. $\frac{1}{4}$ of 16 = —. $\frac{2}{3}$ of 24 = —. $\frac{2}{3}$ of 27 = —.

Material: 12 equal cubes



1. Count the faces on one cube.

2. What kind of figures are they? How do they compare in size?

3. One face of a cube is what part of the whole surface of a cube? 3 faces are what part of the surface? 5 faces? 4 faces?

4. How many equal faces are there on 2 cubes? On 3? On 5?

5. How many cubes must you take to have 12 faces? 18 faces? 30 faces? 42 faces? 48 faces?

6. How many edges has each cube? How do they compare in length?

7. State the length and breadth of a rectangle that contains as many square inches as the surface of a 1-inch cube; as the surface of a 2-inch cube.

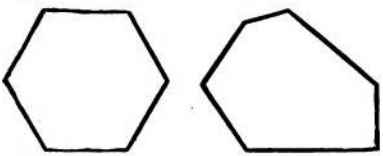
8. How many edges are there on 2 cubes? On 3 cubes?

9. Place 6 of the cubes close together in a row. What kind of a figure is formed by the tops of the cubes? How many squares are there in the top surface? In the bottom surface? In each side? How many in the four sides?

10. How many sets of 6 squares are there in 24 squares?

Oral.

1. How many sides has each of these figures? A figure of six sides is called a **hexagon.** How many sides have 3 hexagons? How many sides have 5 hexagons? 4 hexagons? 6 hexagons? 8 hexagons? 10?



2. If each side is 10 inches long, what is the distance around 1 hexagon?

3. How many 6s in a dozen? How many 6s in 2 dozen? In $2\frac{1}{2}$ dozen? In 5 dozen? In 6 dozen? In $8\frac{1}{2}$ dozen? In 10 dozen? In $6\frac{1}{2}$ dozen?

4. What is the cost of $\frac{1}{2}$ dozen eggs at 24 cents a dozen? What is the cost of $1\frac{1}{2}$ dozen?

5. When 6 eggs cost 8 cents, how much are eggs per dozen?

6. When a dozen and a half cost 18 cents, what is the price of eggs per dozen?

7. A family uses 6 eggs for breakfast 3 days in a week and 6 eggs for cooking 4 days in a week for 3 weeks, how many dozen do they use in all?

8. If 2 eggs are used in making a dozen cookies, what part of a dozen is used for 4 dozen cookies? What are the eggs worth at 18 cents a dozen?

9. When cookies are worth 10 cents a dozen, what are 18 cookies worth? $3\frac{1}{2}$ dozen cookies? $2\frac{1}{2}$ dozen?

10. Susie baked cookies and sold them at 10 cents a dozen. The materials for a dozen cookies cost her 6 cents, how much did she make on 10 dozen cookies?

1. How many sides has each cell of a honeycomb?

A wall between two cells is counted as a side of each.

How many sides have 2 cells? 3? 4? 6? 5? 10? 7? 8?

2. A bee has 6 pockets for wax. 4 bees have — pockets? 8 bees? 6? 10? 7?

3. A bee has 6 legs and a food pouch on each leg. How many food pouches have 8 bees? 5 bees? 6 bees? 9 bees? 10 bees?

4. If a bee visits 6 plants in a quarter of an hour, how many does he visit in an hour? In 2 hours? In $2\frac{1}{2}$ hours?

5. Make 10 rows of 6 dots each. How many dots are there in the first 2 rows? 2×6 dots = — dots.

3×6 dots = — dots. 4×6 dots = — dots

8×6 dots = — dots. 9×6 dots = — dots.

7×6 dots = — dots. 10×6 dots = — dots.

6. Count by 6s to 60 and write the numbers as you count.

7. Count by 6s from 60 to 102 and write the numbers as you count.

8. What part of 12 is 6? Of 24? What part of 24 is 18?

9. How many sixes are there in 36? In 48? In 54? In 24? In 42?

10. 1×6 = —. 2×6 = —. Form a table of the multiples of 6 to 10×6 and learn them.

Oral and written.

At a certain time of day the shadow of any object in the sunlight is 6 times its length.

1. How long is the shadow of a man 6 ft. tall?

2. Of a block of stone 3 ft. high?

3. If the man stands on the block, what is the length of the shadow of both?

4. At this time of day, how long is the shadow of a boy 4 ft. tall? Of a tree 8 yd. high?

5. Of a pole 10 ft. high? Of a wall 9 yd. high?

6. What is the length of a shadow cast by a statue 6 ft. high standing on a base 3 ft. high?

7. A post whose shadow is 30 ft. is — ft. high.

8. A tree whose shadow is 48 ft. is — ft. high.

9. A monument whose shadow is 60 ft. is — ft. high.

10. A boy whose shadow is 24 ft. is — ft. tall.

11. A post whose shadow is 42 ft. is — ft. high.

12. In Excs. 10, 11, if the boy stands on the post, what is the length of the shadow cast by both?

13. The shadow of a building extended across a 12-ft. sidewalk and a 65-ft. street; what was the building's height?

Oral.

1. How many days are there in June? If it rained $\frac{1}{6}$ of the month, how many rainy days were there in June? What part of the month was dry weather? How many days in this part?

2. How many days in September? If school opens on the eleventh, what part of the month has passed?

3. When $\frac{2}{3}$ of November has passed, how many days remain? When $\frac{5}{6}$ of April has passed, how many days remain?

4. A school-day which begins at 9 A. M. and ends at 3 P. M. is what part of a whole day?

5. What part of a day is the time from 6 A. M. until 2 P. M.? What part of a day is the time from 6 A. M. until 10 P. M.?

6. How many hours in $\frac{1}{8}$ of a day? In $\frac{1}{3}$ of a day? In $\frac{2}{3}$ of a day? In $\frac{5}{6}$ of a day?

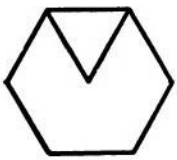
7. How many working-days are there in a week? A man worked $\frac{2}{5}$ of a week; how many days did he work?

8. A man earns $1\frac{1}{3}$ dollars a day; how many dollars does he earn in 3 days?

9. A boat left New York on Monday at noon and reached Liverpool the next week Saturday at noon. In how many days did the boat go from New York to Liverpool? If the boat traveled at the same rate, what part of the way had it gone at noon on the first Friday? At noon on the first Wednesday? At noon on Sunday?

10. Make and solve 3 other problems about time.

1. Draw a hexagon shaped like the figure, mark its center, and connect this point with each corner. Into how many parts is the hexagon divided?



2. Shade $\frac{1}{6}$ of it. Shade $\frac{1}{3}$ of it. Show that $\frac{1}{2}$ of $\frac{1}{3}$ of the hexagon equals $\frac{1}{6}$ of it.

3. Show that $\frac{4}{6}$ of the hexagon is the same as $\frac{2}{3}$ of it.

4. Show that $\frac{1}{3}+\frac{1}{6}$ of the hexagon is the same as $\frac{1}{2}$ of it.

5. Show that $\frac{2}{3}+\frac{1}{6}$ of the hexagon is the same as $\frac{5}{6}$ of it.

6. Show that $\frac{2}{3}-\frac{1}{6}$ of the hexagon is the same as $\frac{1}{2}$ of it.

7. Show that $\frac{1}{3}-\frac{1}{6}$ of the hexagon is the same as $\frac{1}{6}$ of it.

8. How many inches wide is cloth $\frac{2}{3}$ of a yard wide?

9. How many badges 6 inches long can be made from 1 yard of ribbon?

10. $\frac{5}{6}$ of the braid on a spool is wound off; what part is left on? If the part left on is 6 inches, how many inches were there on the spool?

11. How many working-days are there in 2 weeks with no holidays? A man works $\frac{1}{5}$ of the 2 weeks at home and $\frac{1}{2}$ as long in his garden; how many days does he work in his garden?

12. 4 is — of 6. 8 is — of 12. 12 is — of 18.

13. 5 is — of 30. 15 is — of 30. 25 is — of 30.

1. Find the width of the window from the outside of one casing to that of the other. Find the length and breadth of the window-panes.

2. Find with the least amount of measuring how many feet of baseboard are needed to go around the room.

3. Draw a horizontal line 4 inches long, and at one end of it draw a vertical line 3 inches long. Draw a line connecting the ends of these lines. Measure the length of this line.

4. Draw a rectangle 2 in. wide and 6 in. long. Shade $\frac{1}{3}$ of it; $\frac{2}{3}$ of it; $\frac{4}{6}$ of it; $\frac{5}{6}$ of it.

5. Compare the length of a 12-inch line with that of a 6-inch line.

6. Compare the length of a 6-inch line with that of one $\frac{3}{4}$ of 8 inches long.

7. Compare the number of inches in $\frac{1}{3}$ of a 6-inch line with that in $\frac{1}{4}$ of an 8-inch line.

8. Compare the number of inches in $\frac{3}{4}$ of a 12-inch line with that in $\frac{2}{3}$ of a 6-inch line.

9. Compare the number of inches in $\frac{1}{6}$ of a 12-inch line with that in $\frac{2}{3}$ of a 6-inch line.

10. Compare the number of inches in $\frac{1}{2}$ of a 12-inch line with that in $\frac{1}{2}$ of a 6-inch line.

11. Compare the number of inches in $\frac{1}{3}$ of a 12-inch line with that in $\frac{1}{2}$ of an 8-inch line. Compare the number of inches in $\frac{1}{6}$ of a 12-inch line with $\frac{3}{4}$ of that in an 8-inch line.

12. Find the number of yards of molding that would be required to go around the school-room.

Oral. Add by columns and by rows :

1. $3+3+3+3+3+3$.
2. $1+2+3+4+5+6$.
3. $7+3+6+1+2+3$.
4. $2+1+3+5+4+6$.
5. $4+4+4+4+4+4$.
6. $5+4+3+2+1+0$.

Subtract :

1. 32	2. 26	3. 45	4. 59	5. 89
19	15	23	36	71
6. 44	7. 99	8. 73	9. 67	10. 59
39	29	36	48	30

Add :

1. 27	2. 25	3. 35	4. 60	5. 29
39	36	29	43	17
6. 47	7. 80	8. 58	9. 45	10. 25
23	19	27	35	65

Find :

1. $\frac{1}{2}$ of:
   2, 6, 4, 10, 8, 16, 12, 14, 24, 20.
2. $\frac{1}{3}$ of:
   6, 9, 3, 15, 12, 24, 21, 18, 30, 27.
3. $\frac{2}{3}$ of the same numbers.
4. $\frac{1}{4}$ of:
   4, 12, 8, 16, 20, 24, 32, 28, 40, 36.
5. $\frac{3}{4}$ of the same numbers.
6. $\frac{1}{6}$ of:
   6, 12, 24, 18, 36, 30, 48, 42, 60, 54.
7. Make and solve 5 problems of each kind given.

1. How many working-days are there in a week? If Miles earns 6 cents a day by selling papers, how much does he earn in a week?

2. A quantity of grain filled a 40-bushel bin and 12 2-bushel bags; how many bushels of grain were there?

3. Margaret rises at 6 A. M. and retires at 8 P. M.; how many hours does she sleep?

4. How many quarts of milk at 5 cents a quart can be bought for 50 cents? For 1 dollar?

5. If a family buys 1 quart of milk a day at 5 cents a quart, how much would they pay for milk in November? In February of a leap year?

6. How many leap years between the years 1905 and 1925?

7. Two articles together cost 74 cents, and one of them cost 32 cents; how much did the other cost?

8. A purse cost 25 cents and a knife 15 cents more than the purse; how much did both cost?

9. Herbert is 10 years old and his age is $\frac{1}{4}$ of that of his uncle; how old is his uncle?

10. How many months are there from the beginning of the year to the middle of May?

11. A milkman sold $\frac{1}{5}$ of a 10-gallon can of milk in pints and the rest in quarts; how many pints did he sell? How many quarts?

12. A lawn is 30 yd. wide and the house $\frac{2}{3}$ as wide; how many yards wide is the house?

13. On a building 40 ft. high is a flagpole $\frac{1}{4}$ as high; how high is the top of the flagpole from the ground?

Oral or written. Make problems and solve them :

1. From a roll of carpet containing 48 yd. 4 pieces of 6 yd. each are sold.

2. A stairway has 18 steps and each step is 6 in. high.

3. A man $\frac{3}{4}$ of the way up a telephone-pole is 24 ft. from the ground.

4. 4 pounds of lard are sold for 36 cents.

5. Lester picked 20 qt. of cherries and received 40 cents.

6. A girl made a 37-cent purchase and gave the clerk 50 cents.

7. George had 31 cents in the least number of coins possible.

8. A man worked in a factory 10 hours on Monday, 9 hours on Tuesday, 8 hours on Wednesday, 10 hours on Thursday, and 5 hours on Friday.

9. The twelfth of February is Lincoln's birthday, and the twenty-second is Washington's birthday.

10. May thirtieth is Memorial day and July fourth is Independence day.

11. A man 6 ft. tall climbs a tower 8 times his height and then a flagpole 3 times his height.

Oral.

12. 3 qt. and 1 pt. equal — pints.

13. 2 ft. and 6 in. equal — inches.

14. 2 yd. and 6 in. equal — inches.

15. 23 in. equal — foot and — inches.

1903 DECEMBER 1903						
S.	**M.**	**T.**	**W.**	**T.**	**F.**	**S.**
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1. How many days are there in a full week?

2. How many days are there in 2 full weeks?

3. How many days are there in 3 full weeks? In 4 full weeks?

4. Name a month which usually has 28 days. How many weeks is this? How many days has this month at other times?

5. How many whole weeks and how many days besides has a month of 30 days?

6. Name a month that is 2 days longer than 4 full weeks.

7. Observe the calendar on this page. On what day of the week did December, 1903, begin? On what day did it end? How many days has December?

8. A month of 31 days is how many whole weeks and what part of a week besides?

9. Rule and make a calendar for the present month. Make and solve several problems about it.

Oral.

1. If a pistol has 7 places for caps, how many caps will it take to load the pistol twice? 3 times? 4 times? 5 times?

2. How many times will 70 caps load the pistol? 49 caps? 63 caps?

3. When all the places have been loaded and fired 5 times, how many caps have been used? What part of 70 caps has been used?

4. If a box of 70 caps costs 10 cents, how many caps do you get for a cent? How much does it cost to load the pistol 4 times? 5 times? 7 times?

5. If the pistol costs 35 cents and a box of caps 5 cents, the pistol costs how many times as much as the caps? The cost of the caps is what part of the cost of the pistol?

6. The cost of a 10-cent box of caps is what part of the cost of a 35-cent pistol?

7. How many times may a pistol taking only one cap be loaded from 49 caps? How many times may a pistol holding 7 caps be loaded from 49 caps?

8. How many bunches of firecrackers at 7 cents a bunch can be bought for 14 cents? For 28 cents? For 56 cents? For 42 cents?

9. What is the cost of 3 bunches of firecrackers at 7 cents a bunch and 2 packages of torpedoes at 15 cents a package?

10. What is the cost of a half dozen flags at 7 cents each? Make and solve other problems.

1. Draw on the blackboard 11 vertical strokes 7 inches apart. The second stroke is how many inches from the first? The third is how many inches from the first? From the second?

2. The seventh is how many inches from the third? From the fourth? From the fifth?

3. The ninth line is how many inches from the sixth? From the fourth? From the first? Fifth? Seventh? Third?

4. The eleventh line is how many inches from the seventh? From the tenth? From the first? From the eighth? From the fifth?

5. If the strokes represent poles 7 yards apart, how long is the row of poles?

6. Count by sevens from 7 to 70; from 70 to 105. Write the multiples of 7 as you count.

7. $6\times7=$—. $9\times7=$—. $5\times7=$—.

8. $7\times7=$—. $8\times7=$—. $10\times7=$—.

9. How many sevens in 49? In 42? In 28? In 63? In 21? In 70? In 56? In 35? In 14? In 77?

10. How many ones are there in 7? How many twos in 14? How many sevens in 49? What is one of the seven equal parts of any quantity called?

11. 7 is what part of 14? Of 21? Of 28? Of 42? Of 35?

12. $\frac{1}{2}$ of 28 is how many more sevens than $\frac{1}{4}$ of 28?

13. $2\times7=$—. $3\times7=$—. Form a table of the multiples of 7 to 10×7 and learn them.

Written.

1. How many days are there from January 1 to February 18, counting both of these days? How many weeks are there in this period?

2. How many days from Christmas to Washington's birthday, counting both of these days? How many weeks and how many days besides are there in this period?

3. How many days from September 1 to October 19, counting both of these days? How many weeks?

4. A man earning 28 dollars a week, spends $\frac{1}{7}$ of his wages for board and saves $\frac{2}{7}$; how many dollars does he spend for other things?

5. One man earns 1 dollar a day and another 7 times as much. In 6 days the second man earns how much more than the first?

6. A plot 84 feet long and 56 feet wide is inclosed by a board fence. The posts are 7 feet apart; how many are there in the fence?

7. Make a drawing of the plot of Exercise 6 and place dots to show where the posts are.

8. If the fence is 7 feet high, how many feet of boards 1 foot wide are used to cover a space between 2 adjacent posts? To cover 2 such spaces?

9. If the posts cost 7 cents each, the stringers for each length 7 cents, and the boards 1 cent a foot, what is the cost of the material to build the first 2 lengths of the fence?

10. If it costs 40 dollars to build the whole fence, how much does it cost per length?

1. The numbers in the first column are formed by increasing by one, those in the second by increasing by two, and so on. Make a new table like this and fill out all the spaces.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10					
3	6	9	12						
4	8	12							
5	10								
6									
7									
8									
9									
10									

2. Draw a picture of a door 6 feet high and 3 feet wide. Make the picture 6 inches high. What length in the picture stands for 1 foot on the door? How wide should the picture be made?

3. Using 1 inch in the picture for 1 yard in the object, draw the picture of a floor 8 yards by 10 yards. Divide it so as to make floors for 4 equal rooms.

4. How many yards of carpet 1 yard wide will it take to cover one of these rooms?

5. At 20 cents a square yard, what will it cost to paint one of these floors? 2 of them? At 10 cents a square yard, what will it cost to oil the other floor?

6. Give orally the result of dividing each number in each row by the number at the left of the row. Thus, there are four threes in 12.

3	12	18	36	24	15	21
4	12	24	48	32	28	16
5	25	60	45	35	20	80
6	12	36	72	24	54	42
7	49	14	28	35	42	63

1. How many bricks are there in the top row?

2. How many are there in the second row? In each row?

3. How many bricks are there in 2 rows? In 3 rows? In 5 rows? In 8 rows? In 7 rows? In 4 rows? In 6 rows? In 9 rows? In 10 rows?

4. If the wall is one brick thick, how many bricks are there in $\frac{1}{2}$ of it? In $\frac{1}{4}$ of it? In $\frac{1}{8}$ of it?

5. How many rows 8 bricks long can be laid with 32 bricks? With 40 bricks? With 56? With 64? With 72? With 16? With 48?

6. How many bricks are there in $\frac{1}{2}$ of 2 rows? In $\frac{1}{4}$ of 4 rows? In $\frac{1}{8}$ of 8 rows?

7. Fold a piece of paper 8 inches by 10 inches into 1-inch squares. How many rows of 8 squares each are there in the rectangle? $8 \times 8 = —$.

Written.

1. If a man works 8 hours a day, how many hours does he work in 6 days? In 2 weeks?

2. A man worked 6 days of 8 hours each one week; 4 days the next; 5 days the next. How many hours did he work in 3 weeks?

3. The time worked by 8 men in an 8-hour day is the same as how many hours for 1 man?

4. The time worked by 6 men is the same as how many hours for 1 man?

5. How many dollars does a man earn in 4 hours, if he earns 2 dollars in an 8-hour day?

6. How much does he earn in 1 hour? In 1 week? In 2 weeks? In 4 weeks?

7. How many cents does a painter earn in 4 hours at 20 cents an hour?

8. How many cents does he earn in 8 hours? This is how many cents over a dollar?

9. The painter bought 5 pounds of mutton at 8 cents a pound; how much was left out of a day's wages (8 hours)?

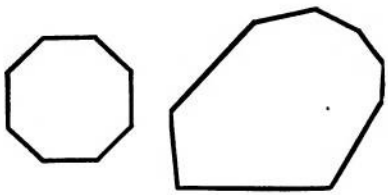
10. A man earns $1\frac{1}{2}$ dollars and buys 6 pounds of 8-cent beef; how much is left out of his wages?

11. What do 2 pounds of beefsteak cost at 16 cents a pound?

12. How much has a man left out of 1 dollar and 60 cents after paying for 2 pounds?

13. At 8 cents a pound what is the cost of 3 pounds of sausage and 2 pounds of lard?

1. Count by eights from 8 to 80. Write the multiples of 8 as you count.



2. How many sides has each figure? A figure of 8 sides is called an **octagon**. How many sides have 2 octagons? 4? 6? 8? 5? 7?

3. If each side of an octagon is 8 inches, what is the distance around it? What is the distance around it, if each side is 4 inches? 5 inches? 9 inches?

4. If there are 8 leaves in one section of a book how many leaves are there in 3 such sections? In 5? 8? 6? 7? 10? 4? 2?

5. If the 8 leaves of a section are folded from 1 sheet of paper, how many sheets are needed for 24 leaves? For 48 leaves? For 80 leaves? For 40 leaves? For 32 leaves? For 56 leaves?

6. How many pages are there on 1 leaf? On 8 leaves? In 2 sections? How many leaves has a book of 80 pages? How many sheets folded into 8 leaves were used for this book?

7. 8 and 8 and 8=—×8=—.

8. 6×8=—. 9×8=—. 7×8=—.

9. 5×8=—. 8×8=—. 10×8=—.

10. How many eights are there in 24? In 40? In 72? In 64? In 32?

11. 2×8=—. 3×8=—. Form a table of the multiples of 8 to 10×8 and learn them.

Material: Sawdust or grain, a quart measure and a peck measure

1. Fill a quart measure with sawdust. Pour its contents into a peck measure. Fill the peck measure in this way. How many quarts in a peck?

2. How many pecks of grain would a half-bushel measure hold? How many quarts would it hold? How many quarts would a bushel measure hold?

3. A grocer sold a half-bushel of blueberries one quart at a time; how many sales did he make?

4. A hotel keeper bought 16 quarts of strawberries at 25 cents a peck; how much did they cost him?

5. Bring some pasteboard or wooden boxes. Estimate and test the capacity of each.

6. How many 16-quart crates of berries are there in 1 bushel? In 2 bushels? In $5\frac{1}{2}$ bushels?

7. A gardener sold 40 such crates of berries in a season; how many bushels of berries did he sell?

8. When a grocer has sold 24 quarts out of 2 crates, what part of a bushel is left?

9. A grocer had 10 bushels of apples and sold 17 pecks; how many pecks had he left?

10. A customer bought 12 quarts of cherries at 60 cents a peck; what did the cherries cost him?

Find the sums:

11. 33 qt. 67	12. 29 pt. 46	13. 17 bu. 46
14. 43 pk. 39	15. 59 qt. 37	16. 36 bu. 57

17. Make and solve 5 problems in subtraction.

Oral and written.

1. How many cherry trees in an orchard of 8 rows of 10 trees each?

2. If the trees bear $\frac{1}{2}$ of a bushel of cherries per tree in a season, how many bushels does the orchard bear?

3. If the trees bear $1\frac{1}{2}$ times as much the next season, how much do they bear in the two seasons?

4. The trees are 8 yd. apart, the outer ones being 4 yd. from the fence; the orchard is — yd. long.

5. The orchard is — yd. wide and — yd. around.

6. James picked 18 qt. of cherries in the forenoon and 25 qt. in the afternoon; he picked — quarts.

7. William picked 32 qt. of cherries, and Charles 17 qt.; how many quarts did they both pick?

8. There are 16 quart baskets in a crate; how many quarts of cherries in $1\frac{1}{2}$ crates? In 2 crates?

9. A fruit grower paid $\frac{1}{2}$ cent a quart for picking cherries that sold for 6 cents a quart; how much did he make on a peck?

10. How many trees in a quince orchard having 4 rows of 6 trees each?

11. Each tree bears $1\frac{1}{2}$ bushels; how many bushels does the orchard bear in a season?

12. What is the yield of this orchard in 2 seasons?

13. The expense of marketing each bushel is:

5 cents for picking,	11 cents for crate,
9 cents for cartage,	27 cents for freight.

What is the total expense per bushel?

1. Make a 12-inch square and divide it into 4-inch squares. Number the squares and shade as in the picture.

2. The picture shows a top spinning in the middle of such a square. A cube is dropped on the top and is thrown upon some square. The number on the square tells how much it counts. If it is a white square the count is forward in the game; if it is a shaded square the count is backward in the game. Thus, if the cube falls on the square 4 the first time and on 3 the next time, the total count is 1. What is the total count, if in five throws the cube falls on 4, 2, 6, 8, 7?

3. If the one who has the largest total count in 10 throws wins, who wins in the following game?

Gertrude: 4, 8, 1, 5, 6, 7, 4, 8, 3, 8.
Lucile: 2, 4, 1, 6, 7, 8, 3, 6, 4, 5.

By how many counts does she win?

4. Who wins in the following game of 10 trials?

George: 8, 4, 6, 1, 7, 2, 4, 5, 8, 3.
Allen: 1, 6, 7, 5, 2, 3, 4, 7, 1, 2.

By how many counts does he win?

5. If the cube falls on 2 six times, on 6 five times, and on 7 five times, what is the total count?

6. If the cube falls on 2 nine times, on 7 three times, and on 8 nine times, what is the total count?

7. Make and solve 5 more problems for this game.

1. A grocer bought 3 pecks of cherries and sold them in 2-quart lots; how many sales did he make?

2. What is the cost of $1\frac{1}{2}$ bushels of turnips at 8 cents a peck?

3. The morning session of a school lasts from 9 A. M. until noon. This is what part of a whole day?

4. If a rope is cut into 7 equal parts and one part is 7 feet long, what was the length of the whole rope?

5. A square game-board contains 64 square inches; what is its length and breadth?

6. Find the number of days in any year not a leap year.

7. How many times will a 5-gallon can of oil fill a lamp holding one pint?

8. What part of 21 days are 7 days? 14 days?

9. Beginning with to-day, record each morning for a week whether it rained or snowed on the day before. What part of the whole week is the number of stormy days?

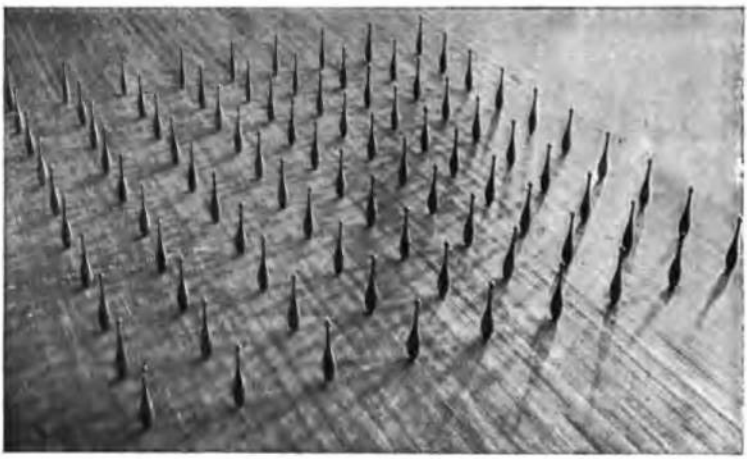
10. How many more sevens are there in 49 than in 35? In 63 than in 49? In 63 than in 35?

11. Jennie was sent for 7 pounds of sugar at 5 cents a pound, and $\frac{1}{2}$ gal. of vinegar at 8 cents a quart; what did her purchases cost?

12. What change did she return from 75 cents?

Add:

13.	14.	15.	16.	17.
36	27	3	59	20
29	61	42	17	61



Oral.

1. How many Indian clubs are there in the front row of the picture? How many are there in the second row?

2. How many clubs are there in the first two rows? In 3 rows? In 4 rows? In 5 rows?

3. 2 times 9 clubs are — clubs. 3 times 9 clubs are — clubs. 4 times 9 clubs are — clubs. 6 times 9 clubs are — clubs.

4. How many clubs are there in the picture?

5. How many clubs are needed for one pupil? How many pupils will 2 rows of clubs supply? How many will 4 rows supply? How many clubs will 18 pupils need?

6. How many pupils will 6 rows supply? 8 rows?

7. How many pupils will 90 clubs supply?

Oral.

1. $9+9=18$. How many nines are there in 18? $2\times9=$—.

2. $9+9+9=27$. How many nines are there in 27? $3\times9=$—.

3. $27+9=$—. How many nines are there in 36? $4\times9=$—.

4. $36+9=$—. How many nines are there in 45? $5\times9=$—.

5. $45+9=$—. How many nines are there in 54? $6\times9=$—.

6. $54+9=$—. How many nines are there in 63? $7\times9=$—.

7. $63+9=$—. How many nines are there in 72? $8\times9=$—.

8. $72+9=$—. How many nines are there in 81? $9\times9=$—.

9. $81+9=$—. How many nines are there in 90? $10\times9=$—.

10. Is the height of your school-room more or less than 9 ft.?

11. How many nines are there in 63? In 45? In 36? In 90? In 72? In 81? In 54? In 18?

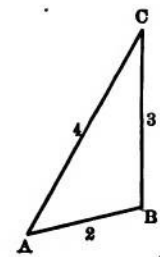
12. What is the cost of 5 yd. of ribbon at 9 cents a yard?

13. What is the cost of 8 yd. of lace at 9 cents a yard?

14. 10 spools at 9 cents a spool cost — cents.

15. 7 yd. of braid at 9 cents a yard cost — cents.

1. The picture shows the relative positions of 3 villages and the distances in miles between them. How many miles is it around the triangle from A to A?



2. A postman lives at B and his route goes around the triangle. How many miles does he travel in making one delivery?

3. If he makes one delivery daily, how many miles does he travel in 2 days? In 5 days? In 10 days? In 8 days?

4. A milkman lives at C and makes a trip to B twice each day; how many miles does he travel in a day?

5. How many round trips does the milkman make in traveling 18 miles?

6. How many more miles does the postman travel in 3 days than the milkman?

7. How many times does the postman go around the triangle in traveling 45 miles? 72 miles?

8. How many more round trips does the milkman make than the postman in traveling 36 miles?

9. $9\times8=$—. $8\times9=$—. $9\times7=$—.

10. $7\times9=$—. $9\times6=$—. $6\times9=$—.

11. $9\times5=$—. $5\times9=$—. $9\times4=$—.

12. $4\times9=$—. $9\times3=$—. $3\times9=$—.

13. In Exercises 9–12 select the sets of equal results.

14. Make a table of the multiples of 9 from 2×9 to 10×9 and learn them.

Oral or written.

1. How many players are there in a baseball team?

2. If each player hits the ball 3 times in a game, — hits are made?

In a regular game each team takes the field 9 times. When each team has taken the field once, this part of the game is called an *inning*. If a player runs around the diamond, he is said to make a *run*, which counts 1 in the game. The bases are 90 ft. apart.

3. How many innings are there in a regular game?

4. How many players in the picture are fielders?

5. The fielders are what part of the team?

6. How many players are basemen?

7. The basemen and fielders are — of the team.

8. If each player of a team makes 2 runs in a game, how many runs are made by the team?

9. At one run per player, how many runs does the opposing team make?

10. Which team wins? By how many runs?

11. Make and solve other problems.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

The numbers in the top row of the table tell how many 2s there are in the corresponding numbers of the second row, how many 3s there are in the corresponding numbers of the third row, and so on.

1. What do the numbers in the top row show concerning those in the sixth row? The ninth? The seventh? The tenth? The eighth?

2. The numbers in the first column show how many 2s there are in the corresponding numbers of the second column. What do the numbers in the first column show concerning those in the third column? The fourth? The sixth? The fifth? The eighth? The ninth? The seventh? The tenth?

3. Of what are the numbers in the second row multiples? In the fifth row? In the last?

FRACTIONS AND MEASURES

Fifths and Tenths

1. Into how many equal parts is Figure 1 divided? Figure 3?

2. What is one of the five equal parts of a quantity called?

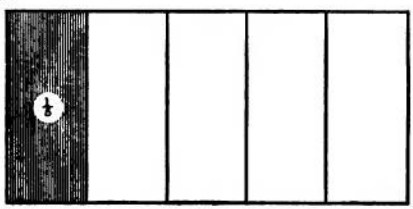


Fig. 1

Fig. 3

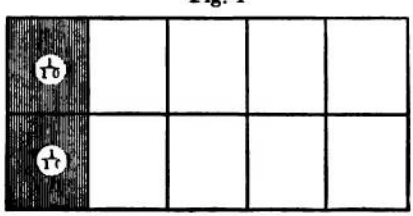


Fig. 2

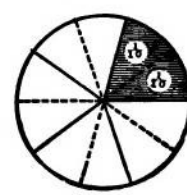


Fig. 4

3. Into how many equal parts is Figure 2 divided? Figure 4?

4. What is one of the ten equal parts of a quantity called?

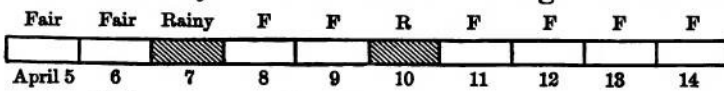
5. How many 2s are there in 10? 2 is what part of 10?

6. How many 4s in 20? 4 is what part of 20?

7. 4 is what part of 10? 8 is what part of 20?

8. How many tenths are there in $\frac{1}{5}$, as shown in Figure 2? How many tenths in $\frac{4}{5}$?

1. On each of 10 successive days note whether it rained (or snowed) that day. If it rained (or snowed) at all, call the day rainy; if not, fair. What part of the whole number of days was rainy? What part was fair? Record your observation in a diagram like this:



2. Make 10 equal strokes; cross out $\frac{1}{2}$ of them. How many tenths of the whole number are crossed out? How many tenths remain?

3. Make 10 equal strokes; cross out $\frac{2}{5}$ of them. How many tenths of the whole number are crossed out? How many tenths remain?

4. From 5 white blocks and 5 red blocks 3 white ones are taken; what part of the white blocks is taken? What part of the whole number of blocks is taken?

5. If from the 10 blocks 2 white and 3 red ones are taken, what part of the whole number is taken? What part of the white blocks is taken?

6. From 10 blocks 8 are taken and $\frac{2}{5}$ of the original number are returned; how many are not returned?

7. Arthur planted 20 seeds. $\frac{3}{10}$ of them were scarlet runners, half of them were nasturtiums, and the rest sweet peas; how many did he plant of each?

8. In a week he found that $\frac{1}{3}$ of the scarlet runners, $\frac{7}{10}$ of the nasturtiums, and $\frac{3}{4}$ of the sweet peas were growing. How many of each kind grew?

9. What part of the whole number of seeds in Exercises 7 and 8 did not grow?

Written.

1. Harold bought for his refreshment stand:

1 bu. of peanuts at 1 dollar and 25 cents per bushel.
Roasting peanuts, 25 cents.
6 lb. of candy at 15 cents per pound.
1 pk. of pop-corn, 40 cents.
1 cake of maple-sugar, 15 cents.
2 dozen lemons at 40 cents per dozen.
5 lb. of sugar at 5 cents per pound.

How much did he pay for each article? For all?

2. He made 40 pop-corn balls and 50 glasses of lemonade. He sold:

The peanuts for 5 cents a pint.
The candy for 10 cents a $\frac{1}{2}$-lb. box.
The pop-corn at 2 balls for 5 cents.
The lemonade for 5 cents a glass.

For how much did he sell the peanuts? The candy?

3. For how much did he sell the pop-corn? The lemonade?

4. How much did he receive altogether?

5. How much did Harold make on all he sold?

6. He kept 60 cents and put the rest in the bank; how much money did he deposit?

7. With the 60 cents he bought seeds and raised plants, and sold:

8 dozen tomato-plants at 15 cents a dozen.
6 dozen cucumber-plants at 10 cents a dozen.
12 dozen celery-plants at 15 cents a dozen.

For how much did he sell the plants?

8. If he deposits the money, how much money has he now in the bank?

Written.

1. Draw on the blackboard an outline of a sheet of cardboard 20 in. by 24 in., and find how many cards 2 in. by 4 in. can be cut from such a sheet.

2. How many dozen cards of this size can be cut from such a sheet?

3. How many sheets of this cardboard are needed to make 10 dozen of these cards?

4. What is the cost of 4 sheets of cardboard at 5 cents a sheet?

5. Henry's father gave him a printing-press and 50 cents for material. He bought cardboard for 15 cents and sold 8 dozen printed cards for 5 cents a dozen. How much did he receive? How much did he make?

6. Henry made a list of the prices of plain material and the prices he would charge as follows:

Material	Cost	Selling Price
Cards,	20 cents per 100.	10 cents a dozen.
Envelopes,	15 " " "	30 " per 100.
Blank bills,	20 " " "	35 " " "
Letter-paper,	25 " " "	40 " " "

He sold 8 dozen score-cards for a ball-game; how much did he make on them?

7. He made 4 lecture tickets from a card and sold 100 tickets at 2 for a cent; how much did he make on them?

8. At another time he printed and sold 200 envelopes; how much did he make on the envelopes?

9. Make and solve three other problems about printing.

The common units for measuring grains, fruits, and other dry commodities are the **pint, quart, peck,** and **bushel.**

There are besides these the half-peck and half-bushel measures.

1. If the pint measure is filled with sand, and the sand is poured into the quart measure, how many times must this be done to fill the quart measure? How many pints are there in a quart?

2. How many times must the quart measure be used to fill the peck measure? How many quarts are there in a peck?

3. How many times must the peck measure be used to fill the bushel measure? One bushel = — pecks.

4. How many quarts are there in a bushel? How many pints are there in a peck?

5. A pint is what part of a quart? A quart is what part of a peck? A pint is what part of a peck? A peck is — of a bushel.

6. — pints = 1 quart. — quarts = 1 peck.
— pecks = 1 bushel. — pt. = 1 qt.
— qt. = 1 pk. — pk. = 1 bu.

Material: Books, blocks, and erasers, or better, bags of sand weighing from 1 pound to 5 pounds. A set of weights is useful.

1. Which is the heavier, your book or your pencil?

2. Which is the lighter, your book or your tablet?

3. Which is the heavier, your book or a blackboard eraser?

4. Of several blocks select the heaviest; the lightest.

5. When one thing is twice as heavy as another it is said to weigh twice as much. Select two blocks one of which you think weighs twice as much as the other.

6. Which is the heavier, $\frac{4}{5}$ of a load of coal or $\frac{3}{4}$ of it?

7. Which is the heavier, a load of wood or a load of coal of the same size?

8. When you buy sugar at the store, in what unit do you express the amount wanted?

9. How many 1-pound sacks of sugar weigh as much as a 5-pound sack?

10. How many 5-pound sacks of sugar weigh as much as 20 pounds of butter?

11. How many 5-pound sacks of salt weigh 50 pounds?

12. A 10-pound sack of salt weighs how many times as much as a 2-pound sack of rice?

13. How many 8-pound jars of butter weigh as much as a 56-pound tub?

14. If a bar of soap weighs $\frac{1}{4}$ of a pound, what is the weight of 100 bars? What is the weight of 5 boxes each containing 100 bars?

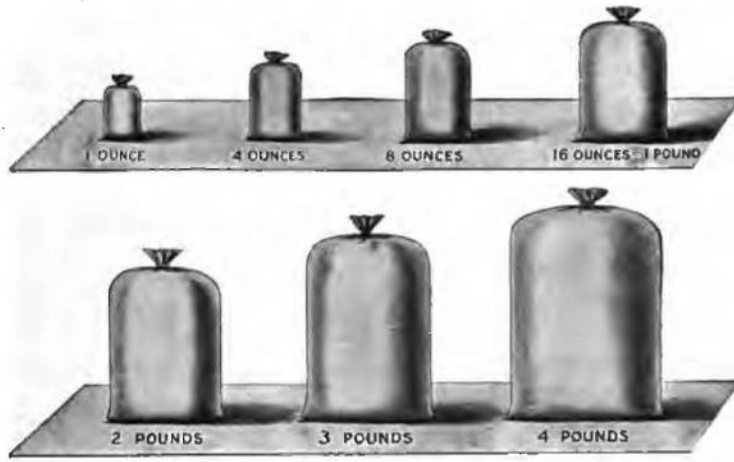
Material: Bags of sand with their weights marked on them, others unmarked

1. Take a 1-pound bag in one hand and a basket containing 8-ounce bags in the other. Change the number of 8-ounce bags until the weights seem to be the same. How many 8-ounce bags in the basket?

2. How many ounces in a pound? How many 8-ounce bags are as heavy as a 1-pound bag?

3. Do the same as in Exercise 1, taking a 3-pound bag in one hand and 8-ounce bags in the other. How many 8-ounce bags are as heavy as a 3-pound bag?

4. Similarly, find how many 4-ounce bags are as heavy as a 1-pound bag; 4 ounces = — of a pound.



Oral.

1. How many 8-ounce bags weigh as much as a 1-pound bag? How many ounces in a pound?

16 ounces (oz.) = 1 pound (lb.)

2. How many 4-ounce bags weigh as much as a 1-pound bag?

3. An 8-ounce weight is what part of a pound weight?

4. A 4-ounce weight is what part of a pound weight?

5. A 1-ounce weight is what part of a pound weight?

6. The 4-pound bag weighs how many times as much as the 1-pound bag? As the 8-ounce bag?

7. What is the cost of 2 lb. of raisins at 12 cents a pound? Of $1\frac{1}{2}$ lb.? Of $\frac{3}{4}$ of a lb.? Of $2\frac{3}{4}$ lb.?

8. Make and solve 5 problems about weight.

Oral.

1. How many sashes has the window in the picture?

2. The surface of each sash and glass is what part of the surface of the whole window?

3. Each pane is what part of the surface belonging to one sash? 2 panes are what part of the surface belonging to 1 sash? To 3 panes?

4. If 2 panes in each sash were replaced by 1, how many panes would there be in the whole window?

5. Each would be what part of the whole window? The panes in each sash would be what part of the whole window? In 2 sashes? In 3?

6. Make a drawing of such a window 2 in. by 4 in.

7. How many panes has the window in the picture? Each is what part of the surface of the whole window? 3 panes are what part? 5 panes? 7 panes? 9 panes? 11 panes?

Read and supply the proper number words:

1. In 4 there are — 2s. $\frac{1}{2}$ of 4 is —.
2. In 6 there are — 3s. $\frac{1}{2}$ of 6 is —.
3. In 6 there are — 2s. $\frac{1}{3}$ of 6 is —.
4. In 8 there are — 4s. $\frac{1}{2}$ of 8 is —.
5. In 8 there are — 2s. $\frac{1}{4}$ of 8 is —.
6. In 9 there are — 3s. $\frac{1}{3}$ of 9 is —.
7. In 10 there are — 5s. $\frac{1}{2}$ of 10 is —.
8. In 10 there are — 2s. $\frac{1}{5}$ of 10 is —.
9. In 12 there are — 6s. $\frac{1}{2}$ of 12 is —.
10. In 12 there are — 4s. $\frac{1}{3}$ of 12 is —.
11. In 12 there are — 3s. $\frac{1}{4}$ of 12 is —.
12. In 12 there are — 2s. $\frac{1}{6}$ of 12 is —.
13. In 14 there are — 7s. $\frac{1}{2}$ of 14 is —.
14. In 14 there are — 2s. $\frac{1}{7}$ of 14 is —.
15. In 15 there are — 3s. $\frac{1}{5}$ of 15 is —.
16. In 16 there are — 8s. $\frac{1}{2}$ of 16 is —.
17. In 16 there are — 4s. $\frac{1}{4}$ of 16 is —.
18. In 16 there are — 2s. $\frac{1}{8}$ of 16 is —.
19. In 18 there are — 9s. $\frac{1}{2}$ of 18 is —.
20. In 18 there are — 2s. $\frac{1}{9}$ of 18 is —.
21. In 20 there are — 10s. $\frac{1}{2}$ of 20 is —.
22. In 20 there are — 5s. $\frac{1}{4}$ of 20 is —.
23. In 20 there are — 4s. $\frac{1}{5}$ of 20 is —.
24. In 20 there are — 2s. $\frac{1}{10}$ of 20 is —.
25. In 24 there are — 12s. $\frac{1}{2}$ of 24 is —.

Written. Show by diagram the meaning of :

1. $\frac{2}{3}$ Thus,

2. $\frac{4}{5}$ 3. $\frac{2}{7}$ 4. $\frac{5}{8}$ 5. $\frac{3}{8}$

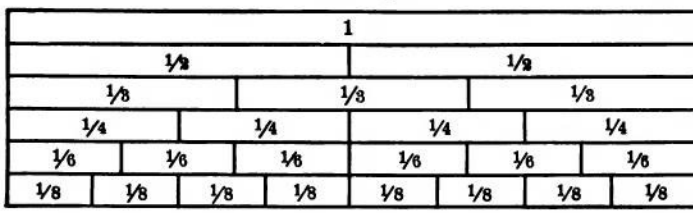
6. $\frac{7}{8}$ 7. $\frac{1}{4}$ 8. $\frac{1}{3}$ 9. $\frac{2}{5}$

Answer by diagram. Which is the greater :

10. $\frac{3}{4}$ or $\frac{2}{4}$? 11. $\frac{4}{5}$ or $\frac{3}{5}$? 12. $\frac{3}{4}$ or $\frac{3}{5}$?

13. $\frac{4}{5}$ or $\frac{4}{7}$? 14. $\frac{3}{9}$ or $\frac{1}{3}$? 15. $\frac{6}{12}$ or $\frac{2}{4}$?

16. $\frac{2}{4}$ or $\frac{1}{2}$? 17. $\frac{5}{10}$ or $\frac{1}{2}$? 18. $\frac{8}{12}$ or $\frac{2}{3}$?



Answer by examining the figure :

19. How many halves make 1?

20. How many fourths make $\frac{1}{2}$?

21. How many sixths make $\frac{1}{2}$? $\frac{1}{3}$? $\frac{2}{3}$?

22. How many eighths make $\frac{1}{4}$? $\frac{1}{2}$? $\frac{3}{4}$?

23. Which is the greater, $\frac{1}{2}$ or $\frac{1}{3}$? $\frac{1}{2}$ or $\frac{2}{3}$? $\frac{1}{6}$ or $\frac{1}{8}$? $\frac{1}{6}$ or $\frac{3}{8}$? $\frac{2}{3}$ or $\frac{3}{4}$?

24. If $\frac{1}{6}$ of an article is worth 10 cents, what is the whole article worth?

25. In November $\frac{3}{10}$ of the days were rainy, $\frac{1}{2}$ of the days were cloudy, and the remainder clear. How many days were clear?

Oral.

1. $\frac{1}{5}$ of 10 is —. $\frac{2}{5}$ of 10 are —. $\frac{4}{5}$ of 10 are —.

2. How many cents are there in $\frac{1}{5}$ of a dime? In $\frac{2}{5}$ of a dime? In $\frac{4}{5}$ of a dime?

3. $\frac{1}{4}$ of 12 is —. $\frac{2}{4}$ of 12 are —. $\frac{3}{4}$ of 12 are —.

4. How many inches are there in $\frac{1}{4}$ of a foot? In $\frac{2}{4}$ of a foot? In $\frac{3}{4}$ of a foot? In $\frac{1}{2}$ of a foot?

5. $\frac{1}{6}$ of 12 is —. $\frac{2}{6}$ of 12 are —. $\frac{5}{6}$ of 12 are —.

6. How many inches are there in $\frac{1}{6}$ of a foot? In $\frac{2}{6}$ of a foot? In $\frac{1}{3}$ of a foot? Compare $\frac{1}{3}$ of a foot with $\frac{2}{6}$ of a foot.

7. How many inches are there in $\frac{3}{6}$ of a foot? In $\frac{1}{2}$ of a foot? Compare $\frac{1}{2}$ of a foot with $\frac{3}{6}$ of a foot.

8. How many inches are there in $\frac{4}{6}$ of a foot? In $\frac{2}{3}$ of a foot? Compare $\frac{4}{6}$ of a foot with $\frac{2}{3}$ of a foot.

9. How many inches are there in $\frac{5}{6}$ of a foot?

10. How many days are there in $\frac{1}{7}$ of a week? In $\frac{2}{7}$ of a week? In $\frac{4}{7}$ of a week? In $\frac{6}{7}$? In $\frac{5}{7}$?

11. How many days are there in $\frac{1}{7}$ of 2 weeks? In $\frac{2}{7}$ of 2 weeks? In $\frac{3}{7}$? In $\frac{4}{7}$? In $\frac{6}{7}$?

12. $\frac{1}{7}$ of 7 is —. $\frac{1}{7}$ of 14 is —. $\frac{2}{7}$ of 14 are —.

13. $\frac{4}{7}$ of 14 are —. $\frac{3}{7}$ of 14 are —. $\frac{6}{7}$ of 14 are —.

14. $\frac{1}{3}$ of 15 is —. $\frac{2}{3}$ of 15 are —. $\frac{3}{3}$ of 15 are —.

15. $\frac{1}{5}$ of 15 is —. $\frac{3}{5}$ of 15 are —. $\frac{4}{5}$ of 15 are —.

16. $\frac{1}{4}$ of 16 is —. $\frac{3}{4}$ of 16 are —. $\frac{1}{8}$ of 16 is —.

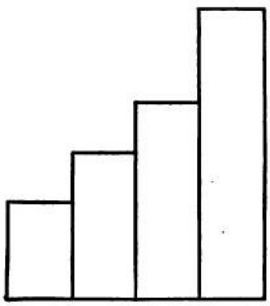
17. $\frac{3}{8}$ of 16 are —. $\frac{5}{8}$ of 16 are —. $\frac{7}{8}$ of 16 are —.

18. $\frac{1}{3}$ of 18 is —. $\frac{2}{3}$ of 18 are —. $\frac{1}{6}$ of 18 is —.

19. $\frac{5}{6}$ of 18 are —. $\frac{1}{5}$ of 20 is —. $\frac{3}{5}$ of 20 are —.

Material: Strips of paper of uniform width and length

1. Cut lengths to represent the numbers 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$. Write the numbers on the slips of paper and arrange them in order of length. The picture shows the unmarked strips arranged in order of length.



Any of these strips may be used in the following exercises.

2. Cut lengths to represent the numbers $\frac{1}{4}$, $\frac{2}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{2}{3}$; mark them and arrange them in order of length. Place any that are equal side by side.

3. Cut lengths to represent the numbers $\frac{3}{4}$, $\frac{3}{5}$, $\frac{2}{5}$, $\frac{2}{3}$, $\frac{1}{2}$. Mark these and arrange them in order of length.

4. Cut lengths to represent the numbers $\frac{1}{6}$, $\frac{5}{6}$, $\frac{3}{6}$, $\frac{1}{2}$, $\frac{4}{6}$, $\frac{2}{3}$. Mark and arrange them in order of length.

5. Cut lengths to represent $\frac{1}{8}$, $\frac{5}{8}$, $\frac{3}{8}$, $\frac{3}{4}$, $\frac{4}{5}$. Mark and arrange them in order of length.

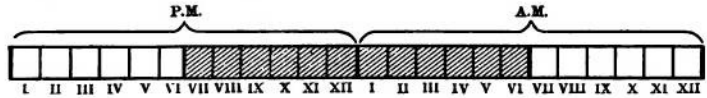
6. Cut lengths to represent $\frac{1}{10}$, $\frac{5}{10}$, $\frac{3}{10}$, $\frac{2}{10}$, $\frac{7}{10}$, $\frac{1}{2}$, $\frac{1}{5}$. Mark and arrange them in order of length.

7. Arrange in order of length the slips marked:
$\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{10}$, 1.

8. Arrange these 6 fractions in order of size:
$\frac{5}{6}$, $\frac{4}{5}$, $\frac{3}{4}$, $\frac{6}{8}$, $\frac{2}{3}$, $\frac{7}{10}$.

9. Shade $\frac{1}{6}$ of a strip of paper with lines running lengthwise; beginning at the same end, shade $\frac{1}{3}$ of the strip with lines running crosswise; what part of the whole strip is shaded by lines running only one way? Solve similar problems; use colors.

1. How many hours are there in a day? How many in the afternoon? How many in the forenoon?



The picture contains 24 spaces, 12 to stand for the hours of the afternoon and 12 to stand for the hours of the forenoon.

2. What part of the diagram is shaded? What part of a day does this represent?

A child 4 years of age should sleep 12 hours each day.
A boy 10 " " " " " 10 " " "
A girl 14 " " " " " 9 " " "

3. A child 4 yr. of age goes to bed at 6 P. M.; at what time should he get up?

4. In the figure point to the hours during which he sleeps.

5. What part of the day is he awake?

6. A boy 10 yr. of age goes to bed at 9 P. M.; at what time should he get up?

7. Draw a diagram to show the part of the day during which he sleeps.

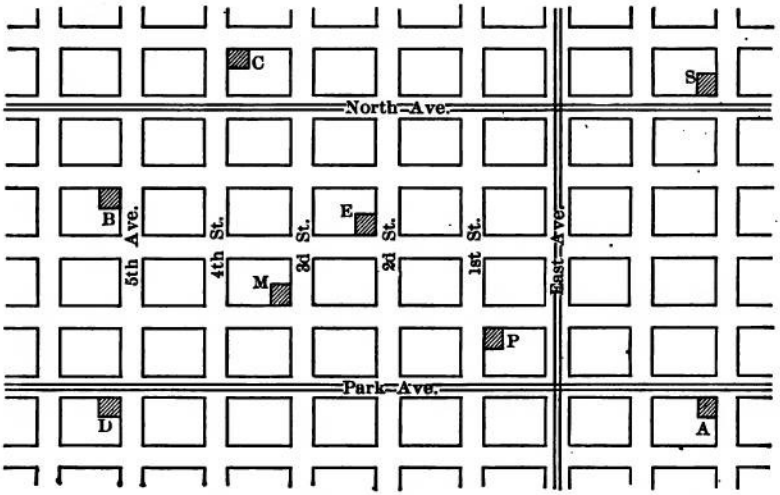
8. What part of 12 hr. are 2 hr.? 10 hr.?

9. What part of 24 hr. are 2 hr.? 10 hr.?

10. What part of a day should a boy 10 yr. old sleep?

11. If a girl 14 yr. of age goes to bed at 9 P. M., at what time should she get up?

12. Draw a diagram shading the part that stands for the hours she should sleep.



In the figure the squares represent city blocks, the double lines in the streets street-railroads, A the house of a banker, B the bank, D the railroad-station, and S the school-building.

1. How many blocks is it from the banker's house to the schoolhouse by the shortest route?

2. If Harry, the banker's son, takes the car, how many blocks does he travel in going to school?

3. If Harry's usual rate of walking is 2 blocks in 5 minutes, how long will it take him to walk to school? If the car goes at the rate of 1 block a minute, how long will it take him to reach the school by the car?

4. If each block is $\frac{1}{8}$ of a mile, what is the shortest distance from Harry's home to the school-building?

5. At his usual rate how long will it take Harry to walk to the railroad-station? How long will it take him to go by car? Make 5 other problems about this map.

1.	2.	3.
2×2= 4	2×3= 6	2×4= 8
3×2= 6	3×3= 9	3×4=12
4×2= 8	4×3=12	4×4=16
5×2=10	5×3=15	5×4=20
6×2=12	6×3=18	6×4=24
7×2=14	7×3=21	7×4=28
8×2=16	8×3=24	8×4=32
9×2=18	9×3=27	9×4=36
10×2=20	10×3=30	10×4=40

4.	5.	6.
2×5=10	2×6=12	2×7=14
3×5=15	3×6=18	3×7=21
4×5=20	4×6=24	4×7=28
5×5=25	5×6=30	5×7=35
6×5=30	6×6=36	6×7=42
7×5=35	7×6=42	7×7=49
8×5=40	8×6=48	8×7=56
9×5=45	9×6=54	9×7=63
10×5=50	10×6=60	10×7=70

7.	8.	9.
2×8=16	2×9=18	2×10= 20
3×8=24	3×9=27	3×10= 30
4×8=32	4×9=36	4×10= 40
5×8=40	5×9=45	5×10= 50
6×8=48	6×9=54	6×10= 60
7×8=56	7×9=63	7×10= 70
8×8=64	8×9=72	8×10= 80
9×8=72	9×9=81	9×10= 90
10×8=80	10×9=90	10×10=100

10.

1	2	3	4	5	6	7	8	9	10
×2	×2	×2	×2	×2	×2	×2	×2	×2	×2

Replace the row of 2s by 3s; by 4s; and so on.

1. $\frac{1}{2}$ gal. = — pt. $\frac{3}{4}$ gal. = — pt. $\frac{4}{8}$ qt. = — pt.

2. 1 bu. = — pk. 1 pk. = — qt. 1 bu. = — qt.

3. $\frac{1}{2}$ bu. = — pt. $\frac{3}{4}$ bu. = — qt. $\frac{5}{8}$ bu. = — qt.

4. 1 lb. = — oz. $1\frac{1}{2}$ lb. = — oz. 32 oz. = — lb.

5. What is the cost of 5 ounces of flower-seeds at 32 cents a pound?

6. Four bean bags have the following weights: 8 oz., 4 oz., 4 oz., and 2 lb.; how many pounds do the four weigh?

7. 32 acres of land are divided into 8 equal parts; how many acres are there in each part?

8. How many square feet are there in the surface of a table 8 feet long and 3 feet wide?

9. How many yards are there in the length of a tablecloth 11 feet long?

10. How many hours does a man work in a week who works 8 hours a day?

11. How many hours does a man work in a week who works 10 hours a day?

12. Make 10 strokes and cross out $\frac{4}{5}$ of them; how many fifths of the whole number remain? How many tenths are crossed out?

13. From 10 blocks $\frac{3}{10}$ are taken; how many blocks are left?

14. How many sixteenths are equal to $\frac{3}{8}$? To $\frac{5}{8}$?

15. $\frac{1}{16}$ is what part of $\frac{1}{8}$? $\frac{3}{16}$ are what part of $\frac{1}{4}$?

16. $\frac{1}{16}$ is what part of $\frac{3}{8}$? Of $\frac{4}{8}$? Of $\frac{1}{2}$? Of $\frac{5}{8}$?

17. Henry sleeps 8 hours a day. What part of the day is he awake?

Oral.

1. Think of a number, multiply it by 2, add 3, take away 5, add 4, and state the result.

2. Think of a number, add to it 2, multiply by 3, subtract 6, multiply by 4, add 10, subtract 7, and state the result.

3. If an article costs 67 cents, what change does the customer receive from 1 dollar?

4. An orchard contains 56 trees in 7 equal rows; how many trees are there in each row?

5. When coal is 6 dollars a ton, what will $2\frac{2}{3}$ tons cost?

6. When peaches are selling 2 for 5 cents, what will 8 peaches cost?

7. When $\frac{1}{2}$ of a yard of cloth costs $\frac{1}{2}$ of a dollar, how much will $1\frac{1}{2}$ yd. cost? $2\frac{1}{2}$ yd.?

8. When a man earns $1\frac{1}{2}$ dollars in $1\frac{1}{2}$ days, how many dollars does he earn in a day?

9. If 6 men can put up a telephone-wire in 3 days, how long will it take 3 men to do it?

10. When a sack of flour costs $\frac{3}{4}$ of a dollar, how much will 2 sacks cost?

11. Cecil is 18 years of age and Clarence is 2 years more than $\frac{1}{3}$ as old; how old is Clarence?

12. Two boys start at the same time from the same place and walk in the same direction, one at the rate of 60 yards per minute and the other at the rate of 70 yards per minute; how far apart are they in 1 minute? In 8 minutes? In 5 minutes? In 10 minutes? In 7 minutes? In 6 minutes?

NOTATION AND NUMERATION

Units, Tens, and Hundreds

1. How many squares are there in Figure 1? How many in Figure 2? How many in Figure 3?

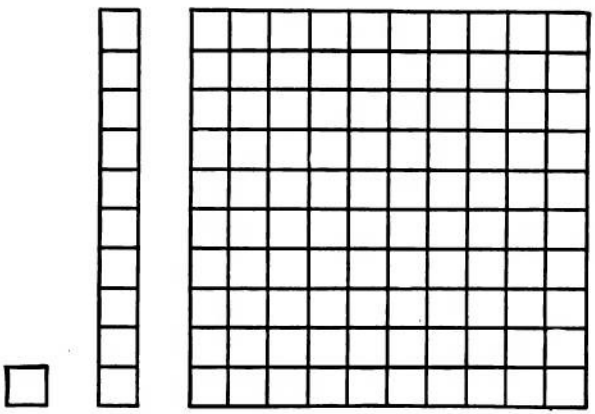


Fig. 1 Fig. 2 Fig. 3

2. Call Figure 1 one. What shall we call Figure 2? Figure 3?

3. If Figure 1 stands for 1 cent, for what does Figure 2 stand? For what does Figure 3 stand?

4. One ten is how many units? One hundred is how many tens? One hundred is how many units?

5. How many units are there in ten? How many tens in one hundred?

6. If Figure 1 stands for 1 year, for how many years does Figure 2 stand? Figure 3?

7. How many columns of ten squares each are there in Figure 3? How many in $\frac{1}{2}$ of Figure 3?

1. What is the usual name for the number 2 tens? The number 3 tens? 4 tens? 8 tens? 10 tens?

2. $90+10=$—. $96+4=$—. $93+7=$—.
$95+5=$—. $98+2=$—. $99+1=$—.

3. Which is tens' place in any number? One hundred is ten tens and how many units besides? Write one hundred in figures.

4. How many places are there in 100? Read the number 200. What does the 2 in the third place show? In 400 what does the 4 in the third place show?

5. Write in figures: Three hundred, five hundred, six hundred, nine hundred, seven hundred, four hundred, eight hundred.

6. What does the third place from the right in any number tell?

7. Compare the numbers in Table 1 with those in Table 2 taken in order.

8. Which column in Table 2 stands for units? Which stands for tens, and which for hundreds?

9. For what does the first figure at the right in all whole numbers stand? The second? The third? What is the third place called? What is the second place called?

Table 1

(3)		(2)		(1)
200	and	10	and	9
300	"	10	"	8
400	"	20	"	7
500	"	10	"	6
600	"	20	"	5
700	"	20	"	4
800	"	10	"	3
900	"	10	"	2

Table 2

(3)	(2)	(1)
2	1	9
3	1	8
4	2	7
5	1	6
6	2	5
7	2	4
8	1	3
9	1	2

	New York.	
0	Grand Cent'l Station ▽	Lv. *6 00
4	125th St. Sta'n ▽	" 6.12
5	138th St. Sta'n	" ....
74	Poughkeepsie ▽	Lv. 8.05
149	Troy ▽	Lv. *9.10
143	Albany ▽	Lv. 10 00
160	Schenectady ▽	" 10.32
228	Utica ▽	" 12530
252	Rome ▽	Lv. 12551
291	Syracuse ▽	Lv. *2500
297	Belle Isle ▽	" ....
300	Warners ▽	" ....
303	Memphis ▽	" ....
308	Jordan ▽	" ....
312	Weedsport ▽	" ....
316	Port Byron ▽	" ....
320	Fox Ridge	" ....
323	Savannah ▽	" ....
329	Clyde ▽	" ....
333	Lock Berlin	" ....
336	Lyons ▽	" ....
341	Newark ▽	" ....
345	East Palmyra ▽	" ....
349	Palmyra ▽	" ....
352	Walworth	" ....
354	Macedon	" ....
362	Fairport ▽	" ....
365	Despatch ▽	" ....
368	Brighton ▽	" ....
369	East Rochester	Lv. ....
371	Rochester ▽	Ar. 4.00
		Lv. 4.05
372	Center Park	" ....
378	Cold Water ▽	" ....
382	Chili ▽	" ....
386	Churchville ▽	" ....
389	Bergen ▽	" ....
393	West Bergen	" ....
397	Byron ▽	" ....
404	Batavia ▽	" 5.00
410	West Batavia	" ....
415	Corfu	" ....
419	Crittenden ▽	" ....
422	Wende	" ....
424	Looneyville ▽	" ....
429	Grimesville ▽	" ....
430	Depew ▽	" ....
433	Forks ▽	" ....
436	East Buffalo	Lv. ....
440	Buffalo ▽	Ar. 6500
440	Buffalo ▽	Lv. *6530
463	Niagara Falls ▽	Ar. 7 05
464	Suspension Bridge ▽	Ar. 7010

Fig. 1

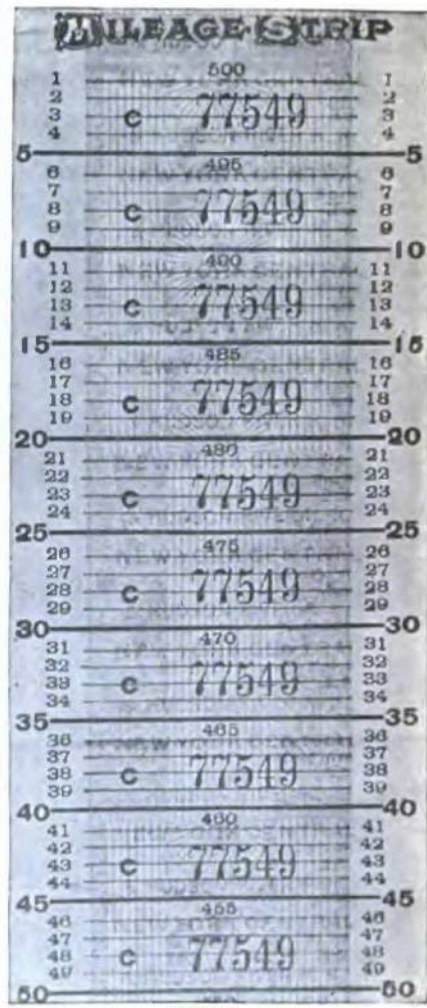


Fig. 2

Figure 1 shows a portion of a New York Central time-table giving distances between all stations from New York City to Buffalo and Niagara Falls, and the time taken by a train to travel this route.

Figure 2 shows a page of a railroad mileage book. If a passenger owning the book rides 5 miles, the conductor tears off the first 5 numbers—that is, tears off the part up to the first heavy line. If at another time the passenger rides 8 miles, the conductor tears off the numbers to 13 inclusive. Thus, the space between each pair of adjacent lines represents a ticket, or coupon for a ride of one mile.

1. The above piece of a mileage strip would pay for a ride of how many miles? $\frac{1}{2}$ of such a piece would pay for how many miles?

2. How many miles is it from New York to Poughkeepsie? In paying for this trip, how many coupons would be left out of a 75-mile piece?

3. How many miles is it from New York to Troy? This trip would require within one coupon of how many 50-mile pieces?

4. From New York to Syracuse would require 9 coupons less than how many 50-mile pieces?

5. From New York to Warners would require how many 50-mile pieces?

6. From New York to Palmyra would require 1 coupon less than how many 50-mile pieces?

7. From New York to Rochester would require how many 100-mile pieces and how many coupons?

8. From New York to Niagara Falls would require how many 50-mile pieces and how many coupons besides?

9. How many 50-mile pieces in 100 coupons? In 200 coupons? In 400? In 500? In 300?

10. $2\times50=?$ $3\times50=?$ $4\times50=?$ $6\times50=?$
$8\times50=?$ $5\times50=?$ $7\times50=?$ $10\times50=?$

1. What are the common silver coins of the United States? What is the value of each?

2. What is the name of the bronze coin? The nickel coin? How much is each worth?

3. Name two coins the sum of whose values is 75 cents. Name 2 silver coins and a nickel coin the sum of whose values is 80 cents. Name a set of coins the sum of whose values is 35 cents; 45 cents; 90 cents.

The symbol for dollar or dollars is \$; and the symbol for cents is ¢.

Thus, 5 dollars is written \$5, and 5 cents is written 5¢.

Amounts of money involving both dollars and cents are written with a period between the number of dollars and the number of cents, the whole being preceded by the dollar-sign.

Thus, 8 dollars and 35 cents is written \$8.35. Also 3 dollars and 5 cents is written \$3.05.

The figures in the first two places at the right of the period stand for cents.

Thus, \$17.35 means 17 dollars and 35 cents.
\$8.05 means 8 dollars and 5 cents.
\$.05 means 5 cents.

The period used to separate the number of dollars from the number of cents is called the **decimal point.**

Read:

4. \$1.25. 5. \$5.50. 6. \$1.06. 7. \$.09.

Write in symbols:

8. Sixty-five cents; one dollar and sixty cents.

9. Ten dollars and forty-five cents; also other amounts.

The usual method of making change at the store is to count forward by adding to the price of the goods purchased enough to equal the amount offered by the customer.

Thus, if a lady buys 65 cents' worth of lace and offers $1, the clerk thinks "65¢ plus 10¢ plus 25¢ is $1," and hands her 1 dime and 1 quarter. He may say in explanation, "Sixty-five, seventy-five, one dollar," as he hands her the dime and quarter.

Likewise, if Carl buys a book for 18¢ and hands the stationer a quarter, the stationer says, "Eighteen, twenty, twenty-five," as he hands Carl 2¢ and 5¢.

Evidently, the change may often be made in different ways. Thus, instead of returning a dime, the clerk may return two 5-cent pieces. But, since the coins are sorted in the till, he generally makes it in the simplest way.

1. Clara bought 35¢ worth of calico, and gave the clerk a half-dollar; what change did she receive?

2. Chester bought 14¢ worth of paper and gave the stationer a quarter; what change did he receive?

Use coins or pasteboard disks and count the change from $1 *for:*

3. A 55-cent purchase.
4. An 80-cent purchase.
5. A 78-cent purchase.
6. A 77-cent purchase.
7. A 56-cent purchase.
8. An 89-cent purchase.

Count the change from:

	9.	10.	11.	12.	13.
Amount:	50¢	25¢	75¢	50¢	$1.50
Purchase:	27¢	13¢	54¢	39¢	$1.25

14. Write in symbols, using the decimal point, the results in Exercises 9–13.

15. State three ways of paying 60¢ in silver.

The picture shows the back of a cash register. If a purchaser makes a purchase of $1.25, the clerk presses the key marked $1, then the key marked 20 in the next column, and the key marked 5 in the last column at the right. The front of the machine also shows this amount, $1.25, to the purchaser. The machine prints this amount on a slip of paper within, which serves as a record of the sale. When making purchases notice whether the cash register shows the amount paid.

Oral. Read the amount of money shown by the cash register by pressing each of the following sets of keys :

	Dollars	Cents	Cents		Dollars	Cents	Cents
1.	1	30	5	2.	1	20	9
3.	2	50	5	4.	2		5
5.	3	10	6	6.	3	20	
7.	1	70	8	8.	5	90	9

9. Write the numbers in Exercises 1–8, using the dollar-sign and the decimal point.

State what keys to press on the cash register to indicate :

10. Two dollars and thirty-five cents.

11. Three dollars and twenty-three cents.

12. Five dollars and seventy-five cents.

13. \$1.18. 14. \$3.29. 15. \$9.99.

16. If no key is pressed in the dollar column, this part of the register shows 0 dollars, similarly for dimes and cents. What keys are pressed to indicate \$0.17, or \$.17? \$.75? \$1.05? \$2.20? \$.08?

The cash register prints on a slip of paper within not only each amount registered, but also the sum of all amounts of money that have been indicated by pressing the keys.

What sums would it print :

17. For pressing the 1-dollar key twice and the 5-dime key 5 times?

18. For pressing the 3-dollar key once, the 1-dime key twice, and the 5-cent key once?

19. Make and solve 10 similar problems.

Write in symbols :

1. Thirteen dollars and fifty cents.

2. Eighteen dollars and nine cents.

3. Twenty-five dollars and sixty-three cents.

4. One hundred dollars and seventy-five cents.

5. Read 25¢, $.25. Name a coin to express this amount.

6. Read 75¢, $.75. Name coins to express this amount.

7. Read 125¢, $1.25. Name coins to express this amount.

8. Read 5¢, $.05. Name a coin to express this amount.

9. Read 3¢, $.03. Name coins to express this amount.

10. Read $2.25; and $25.35. Name coins to express each amount.

11. Read the following and name coins to express each amount: $5.45, $7.30, $15.50, $27.65.

Copy and fill blanks :

12. — cents = 1 dime. — cents = 1 dollar.
— dimes = 1 dollar. — 5-cent pieces = 1 dollar.

Express in symbols :

13. 1 dollar and 25 cents; 3 dollars and 35 cents.

14. 5 dollars, 4 dimes, and 5 cents; 1 dollar and 5 cents.

15. 5 dollars and 45 cents; 10 dollars and 75 cents.

16. 5 dollars and 84 cents; 17 dollars and 15 cents.

ADDITION TO 1000

Integers

A school yard has a walk on one side 196 feet long and one on another side 233 feet long; how many feet long are the two walks?

Add 196 feet and 233 feet.

3 units + 6 units = 9 units.

196
233
429

3 tens + 9 tens = 12 tens, or 1 hundred + 2 tens.

1 hundred + 2 hundred + 1 hundred = 4 hundred.

196 feet and 233 feet are 429 feet.

Written.

1. A school-building is 122 feet wide and 224 feet long; what is the number of feet in the sum of these sides? What is the distance around the building?

2. There are 438 children in one school and 341 in another; how many children are there in both schools?

Add:

3. 324 122	4. 438 341	5. 678 201	6. 234 564	7. 179 210
8. 312 532	9. 415 432	10. 333 666	11. 444 222	12. 347 389
13. 463 487	14. 517 326	15. 720 186	16. 811 115	17. 723 265

NOTE.—The teacher will add as many such exercises as circumstances require.

Written.

1. The lengths of the five Great Lakes are:

Lake Michigan, 330 miles. Lake Erie, 270 miles.
" Superior, 380 " " Ontario, 180 "
" Huron, 250 "

How many miles in the combined lengths of Lake Erie and Lake Huron?

2. How many miles in the combined lengths of Lake Huron and Lake Superior? Of Lake Superior and Lake Erie?

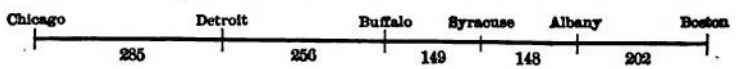
3. How many miles in the combined lengths of:
Lake Erie and Lake Ontario?
Lake Ontario and Lake Huron?
Lake Ontario and Lake Michigan?

4. The number of miles from New York to Boston by water is 310, from Boston to Halifax 302; how many miles from New York to Halifax?

5. The distance from New York to Albany is 143 miles, from Albany to Buffalo 268 miles; how many miles is it by way of Albany from New York to Buffalo?

6. From Detroit to Buffalo is 256 miles, from Detroit to Chicago 285 miles; how many miles is it from Buffalo to Chicago?

7. The numbers in the diagram show the miles between the places named.



Make and solve 4 problems using these distances.

An overcoat for Charles costs \$4.75 and a suit of clothes \$5.50; what is the cost of both?

\$4.75
5.50
\$10.25

$5¢+0¢=5¢$.

5 dimes + 7 dimes = 12 dimes, or \$1 and 2 dimes.

\$1 + \$5 + \$4 = \$10.

Written.

1. Susie has a jacket that cost \$3.65 and a dress that cost \$4.25; how much did both cost?

2. Ralph earned \$16.25 in four months and \$3.75 the fifth month; how much did he earn in all?

3. A grocer received from customers \$4.46 in one hour and \$5.23 the next; how many dollars did he receive in the two hours?

4. The desks in a room cost \$85.50 and the pictures \$8.75; what did they both cost?

Add:

5. \$165.75 149.75 \$	6. \$568.23 20.07 \$	7. \$810.60 184.30 \$
8. \$255.20 365.37 \$	9. \$189.25 96.15 \$	10. \$133.33 66.67 \$
11. \$100.25 800.75 \$	12. \$ 13.25 76.35 \$	13. \$789.65 25.43 \$

14. Make and solve ten problems similar to these.

Written.

1. This table gives the lengths, numbers of officers, and crews of five United States war-ships.

	New York	Brooklyn	Oregon	Olympia	Florida
Length in feet,	380	400	348	340	252
Officers,	40	46	32	34	7
Crew,	522	471	462	413	135

The New York and Brooklyn placed end to end would reach how many feet?

2. How many men does it take to man each of the above ships?

3. How many men does it take to man:
The New York and Brooklyn together?
The Olympia and Oregon together?
The Oregon and New York together?

4. The new battle-ship Tennessee is twice as long as the Florida; how many feet long is the Tennessee?

5. Make and solve 3 similar problems.

6. A gunner receives $150 a month; how much does he get in 2 months?

7. If the captain of a ship receives $291 per month, and the commander of a battery $250, how much do they both receive in a month?

8. An ordinary seaman receives $218 per year, and a first-class seaman receives $288 per year; how many dollars does a man earn who serves 1 year as an ordinary seaman and one as a first-class seaman?

9. The pay of a second-class fireman is $360 a year, of a first-class fireman $420; how many dollars does a fireman earn who serves one year as second-class fireman and the next year as first-class?

NOTATION AND NUMERATION

Thousands

1. Count by tens to 100. Count by hundreds to 900.

10 hundred is called **one thousand** and written **1,000.**

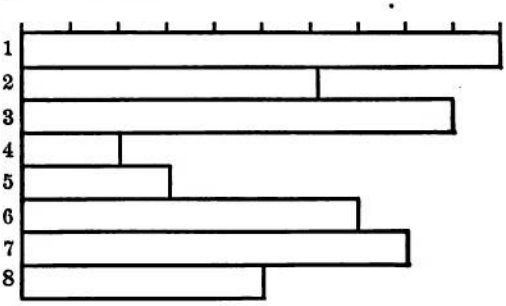
What number is a half of 10? A half of 1,000?

2. Which is the greater number, 9 hundred or 7 hundred? 800 or 900?

3. 8 is how many times 4? 8 hundred is how many times 4 hundred? 900 is how many times 300?

4. 8 hundred is how many times 2 hundred? 1,000 is how many times 200?

5. If the first rectangle stands for 1,000, for what does the next rectangle stand? The 3d? The 4th? The 5th? The 6th? 7th? 8th?



6. Draw a line to represent the distance between two cities, A and B, 1,000 miles apart. Mark a place 500 miles from each of them; and another 200 miles from A. How far is the last place from B?

7. When a train is $\frac{1}{5}$ of the way from A to B in Exercise **6**, how many miles is the train from A?

8. When the train is $\frac{3}{5}$ of the way from A to B, how many miles is it from B?

1. What number is 999 and 1 more?

2. How is this number written? How many figures are there in it?

3. Read: 2,000; 3,000; 7,000; 6,000; 6,300; 5,000; 4,300; 8,000; 9,500; 5,400; 7,400.

4. Write in figures: 2 thousand; 4 thousand; 5 thousand; 8 thousand; 9 thousand; 6 thousand.

5. What is the first place at the right in a whole number? The second place from the right? The third? The fourth?

In writing numbers greater than 1,000, it is best to place the comma after the number of thousands.

Thus, in 3,125 (three thousand one hundred twenty-five), a comma is placed after the 3. This is not done in dates.

6. Write in figures: One thousand three hundred seventy-five; five thousand four hundred; seven thousand five hundred twenty-three; sixty thousand nine hundred forty.

7. Read: The number of miles by water from New York City to

Buenos Ayres	is 7,110.	Havana	is 1,420.
Boston	" 310.	Liverpool	" 3,210.
Cape Horn	" 8,115.	London	" 3,375.
Charleston	" 750.	New Orleans	" 2,045.
Dublin	" 3,225.	Panama	" 2,358.
Gibraltar	" 3,300.	Philadelphia	" 240.
Halifax	" 612.	Porto Rico	" 1,400.

8. Write in figures: Three thousand seven; seven thousand twenty; one thousand forty-nine; nine thousand eight hundred.

1. Write the symbols that appear on the clock-face.

2. For what numbers do these symbols stand?

3. What form is more common for four than IIII?

This way of writing numbers was used by the Romans, hence it is called **Roman Notation.**

4. What is the Roman symbol for ten? For twelve?

5. The numbers from eleven to nineteen inclusive are written by placing the symbols for one, two, . . . nine at the right of the symbol for ten; as XI, XII, etc.

Write in Roman notation:

13, 15, 14, 19, 18, 17, 16.

6. Twenty is written as two tens, thus XX. The numbers from twenty-one to twenty-nine inclusive are written by placing the symbols for one, two, . . . nine at the right of XX. Thus, twenty-two is written XXII.

Write in Roman notation:

21, 25, 23, 26, 24, 29, 27, 28.

7. Thirty is written as three tens, thus XXX. The other numbers from thirty-one to thirty-nine are formed like those from twenty-one to twenty-nine.

Write in Roman notation:

31, 35, 34, 32, 36, 39, 38, 37.

8. Forty is written XL. L stands for fifty and X at the left means ten less. The other numbers to forty-nine are formed in the usual way. Write them.

ADDITION AND SUBTRACTION TO 1000

Addition

In 1900 a certain town cast 135 votes for President, another cast 276, and another 189. How many votes were cast in the three towns?

Add 135, 276, and 189.

9 units + 6 units + 5 units = 20 units.

135
276
189
20
18
4
600

8 tens + 7 tens + 3 tens = 18 tens.

1 hundred + 2 hundred + 1 hundred = 4 hundred.

135 votes + 276 votes + 189 votes = 600 votes.

This plan of writing the partial sums and then adding is an advantage when the columns are long.

Test: Add the figures downward and see if the result is 600.

Written.

1. This table shows the number of votes cast in the first 10 wards of the city of Albany in 1900. How many were cast for Mr. McKinley?

2. How many were cast for Mr. Bryan?

3. How many were cast for Mr. Stanchfield in the first 5 wards? For Mr. Odell?

4. Make and solve 5 similar problems.

ALBANY	PRESIDENT 1900		GOVERNOR 1900	
	Rep.	Dem.	Rep.	Dem.
WARD	McKinley	Bryan	Odell	Stanchfield
1st	924	583	924	582
2d	595	710	594	707
3d	576	871	573	872
4th	599	712	601	710
5th	814	673	782	702
6th	811	649	790	670
7th	783	603	768	613
8th	440	881	439	884
9th	319	788	310	785
10th	623	427	630	429

A brick wall 9 feet square and 8 inches thick contains 135 bricks, and one 9 feet square and 24 inches thick contains 405 bricks; how many more bricks are there in the thicker wall?

Find the difference between 405 and 135.

Minuend 405
Subtrahend 135
Difference 270
Test: 270 + 135 = 405.

One thinks "5 and **0** are 5," and writes **0**; "3 and **7** are 10" and writes **7**; "1 and 1 and **2** are 4" and writes **2**.

The table shows the number of bricks in walls of various sizes.

Square feet of surface in wall.		Thickness.					
		4 in.	8 in.	12 in.	16 in.	20 in.	24 in.
5		38	75	113	150	188	225
6		45	90	135	180	225	270
7	Number	53	105	158	210	263	315
8	of	60	120	180	240	300	360
9	bricks.	68	135	203	270	338	405
10		75	150	225	300	375	450
20		150	300	450	600	750	900

1. How many less bricks in a wall of 5 sq. ft. and 4 in. thick than in a wall of 5 sq. ft. and 12 in. thick?

2. How many more bricks in 20 square feet of a 20-inch wall than in 5 square feet of a 20-inch wall?

3. Make and solve 5 other problems.

4. From the table on page 154 name two wards in which Mr. McKinley received the majority of votes, and find his majority.

5. Name two wards in which Mr. Bryan received the majority, and find it.

Written.

The following tributaries of the Mississippi River are navigable the number of miles stated:

Missouri,	2,900 miles.	Wabash,	365 miles.
Red,	986 "	Illinois,	350 "
Arkansas,	884 "	Alleghany,	325 "
Cumberland,	600 "	Minnesota,	295 "

1. How many miles farther is the Missouri navigable than the Red? The Red than the Arkansas?

2. How many miles farther is the Cumberland navigable than the Alleghany? Than the Wabash?

3. By how many miles does the combined navigable lengths of the Red, Arkansas, and Cumberland exceed the navigable length of the Missouri?

4. Make and solve 5 problems using the above facts.

The following are the great canals of the world with their lengths:

Imperial (China),	1,000 miles.	Caledonia (Scotland),	60 miles.
Languedoc (France),	149 "	Suez (Egypt),	88 "
North Holland,	51 "	Erie (New York),	350 "
Ohio,	332 "	Miami (Ohio),	291 "

Ganges (India) about 355 miles.

5. Which of these canals is the longest? The shortest?

6. How many miles of canal in the whole nine?

7. The Ganges Canal is how many miles longer than the Erie of New York? Than the Languedoc?

8. The Imperial Canal is how many miles longer than each of the four next longest?

9. Find other facts about lengths of rivers. Make and solve problems containing these facts.

A family's expenses for one week were \$13.24. Their meat bill was \$2.26. How much did they pay for other things?

Find the difference between \$13.24 and \$2.26.

\$13.24
2.26
Test: \$10.98
\$10.98 + \$2.26 = \$13.24.

$6¢ + 8¢ = 14¢$. Write 8.
1 dime + 2 dimes + 9 dimes = 12 dimes. Write 9.
\$1 + \$2 + \$10 = \$13. Write 10.

Written.

1. A man spent \$236.25 during 1 year in repairing a house that rents for \$285 a year; how much had he left out of a year's rent?

2. A tailor earned \$135.50 in one month. His expenses were \$95.75; how much had he left?

3. A farmer had a grocery bill of \$17.36 and paid \$12.75; how many dollars did he still owe?

4. A farmer bought \$17.50 worth of groceries and sold the grocer \$9.75 worth of butter; how much money did he pay the grocer?

5. A man bought a bill of goods amounting to \$7.25 and gave the clerk a 10-dollar bill; how much change did he receive?

6. A grocer buys a cheese for \$2.50, a barrel of sugar for \$6.50, and a box of soap for \$3.75; he pays the bill with \$15. How much change does he receive?

7. In a certain store the sales for one day at the silk counter amounted to \$85.65, and at the lining counter \$40.65 less than at the silk counter; how much was received at both counters?

Oral.

1. Count the change from 50¢ for a 26¢ purchase.

2. Count the change from 50¢ for a 44¢ purchase.

3. Count the change from $5 for a $2.50 purchase.

4. Count the change from $5 for a $3.85 purchase.

5. A boy pays 10¢ for ink and 20¢ for a book; what change does he receive out of a 50¢ piece?

6. How would you change $1 for a friend so that he could pay a debt of 39 cents out of the change?

7. Count in two ways the change in $1 for an 85-cent purchase. Which is the simpler?

8. Count in three ways the change in $1 for a 75-cent purchase. Which is the simplest?

9. What is the change out of a half-dollar for a dozen 3-cent car-fares?

10. What is the change out of a quarter for six 3-cent stamps? For seven 2-cent stamps?

11. What is the change out of a half-dollar for 5 pounds of sugar at 7¢ a pound?

12. A merchant sent 5 dollars to the bank for change. He asked for 3 dollars in quarters, 1 dollar in dimes, and 1 dollar in 5-cent pieces. How many coins of each kind did he get?

13. A lady makes a purchase of $1.17 and pays the clerk $1.50; what change does she receive?

Subtract:

14.	15.	16.	17.
$100.27	$500.33	$200.25	$325.70
33.33	99.99	44.76	95.49
$	$	$	$

1. When sirup is 40¢ a gal., what is the price per qt.?

2. 1 gal. = — qt. 1 qt. = — pt. 1 gal. = — pt.

3. 1 bu. = — pk. 1 pt. = — qt. 1 bu. = — qt.

4. 1 lb. = — oz. $\frac{1}{4}$ lb. = — oz. $\frac{5}{8}$ lb. = — oz.

5. Name the months in a year and state the number of days in each month. How many days will February, 1908, contain?

6. Count all the holidays you know of in the year. The number is what part of a 30-day month?

7. Add:	222	444	1009	545
	888	777	909	454
8. Subtract:	\$1000	\$1000	\$8888	\$1005
	367	999	999	555

9. In 333 for what does the 3 at the right stand? The second 3? The three at the left?

10. For how many units does each stand? What shows that the 3s mean different numbers of units?

11. To subtract 10 from a number is to subtract how many from the second digit? Subtract 10 from 855; 20 from 855; 50 from 855.

12. To subtract 100 from a number is to subtract how many from the third digit? Subtract 100 from 765; 300 from 625; 500 from 934.

13. Add 10 to 825; 30 to 825; 50 to 735; 60 to 423.

14. 645 is how many more than 635? Than 615?

15. The publishers of a magazine gave the following prizes for stories: 1st prize, \$100; 2d, \$50; 3d, \$25; 4th, \$10. What was the whole amount?

1. Copy these numbers and divide them into units' and thousands' periods with commas:

683	2100	1600	5280	1451
404	1069	3290	1760	4770

2. Read the numbers in your list.

3. Find the sum of the numbers in each of the above columns.

4. A customer made a purchase amounting to \$4.09. Explain what keys you would press on the cash register, page 144, to indicate this purchase.

5. A man paid \$2,025 for a house and \$375 for furniture; how much did he pay for all?

6. Of the three cases of books in a library, one contains 146 books, another 280, and the other 198; how many books do they all contain?

7. What is a man's annual income who receives a salary of \$1,800, interest on money \$235, and dividends on investments of \$306?

8. The area of the Hawaiian Islands is 6,740 square miles, and that of Porto Rico 3,600; the former contains how many more square miles?

9. The Eiffel Tower in Paris is 984 feet high, and the Washington Monument 555 feet high; the former is how many feet higher than the latter?

10. Denver, Colorado, is 5,175 feet above sea-level, and Chicago, Illinois, 590 feet; Denver is how many feet higher than Chicago?

11. Divide a 4-inch square into square inches. Find the number of sixteenths in $\frac{1}{8}$; in $\frac{1}{2}$; in $\frac{3}{4}$.

MULTIPLICATION

Multipliers of One Figure

1. When wheat is sold by weight, 60 pounds are regarded as a bushel; how many pounds are there in 2 bushels? In 4 bushels?

2. When rye is sold by weight, 56 pounds are regarded as a bushel; how many pounds in 3 bushels of rye?

When several equal numbers are to be added it is possible to shorten the work. Thus, in the following solutions of the last problem process 2 is shorter than process 1.

(1)	(2)	
56		$6+6+6$,
56	56	or 3×6 units $=18$ units.
56	3	5 tens $+5$ tens $+5$ tens,
18	18	or 3×5 tens $=15$ tens.
15	15	150 units $+18$ units $=168$ units.
168	168	

The solution of the problem should be written 3×56 pounds $=168$ pounds.

The result in multiplication is called the **product.**

3. When 60 pounds of potatoes are taken as a bushel, how many pounds in 2 such bushels? In 3 such bushels?

4. When 48 pounds of barley are taken as a bushel, how many pounds in 5 bushels? In 8 bushels?

5. 79	6. 19	7. 88	8. 64	9. 75
2	4	3	5	7
10. 96	11. 78	12. 91	13. 57	14. 46
9	3	8	7	5

Written.

1. A fruit-grower has an orchard of 8 acres, in which there are 15 trees to the acre; how many trees are there in the orchard?

2. If the trees bear 2 barrels per tree, how many barrels of apples do they bear in a season?

3. If each barrel holds 3 bushels, how many bushels of apples are there in the crop?

4. If he receives 2 dollars a barrel for the apples, how many dollars is the crop worth?

5. If an apple picker charges 25 cents a barrel for picking, and picks 12 barrels in a day, how much does he earn in a day?

6. If several apple pickers pick 48 barrels per day, how many barrels do they pick in 6 days?

7. A fruit-grower hires 8 men for one week at $16 each; how much does he pay all of them?

8. If a team can draw 18 barrels of apples at a load, how many barrels can it draw in 5 loads?

9. What will it cost to draw 35 loads of apples to the station at $3 per load?

10. What does it cost to ship 95 bushels of apples to market, at the rate of 9 cents per bushel?

11. If each of three cars holds 90 barrels, how many barrels do these cars hold?

12. A fruit-grower's profit was $2 per barrel on 84 barrels of apples; how much did he make?

13. When the freight charge is $32 per car, what is the charge for 5 cars?

Multiply 423 by 8.

8×3 units $= 24$ units $= 2$ tens $+ 4$ units.

423
8
3384

Write only the 4 units and remember to add the 2 tens to the next product.

8×2 tens $= 16$ tens. 16 tens $+ 2$ tens $= 18$ tens $= 1$ hundred $+ 8$ tens.

Write only the 8 tens and remember to add the 100 to the next product.

8×4 hundreds $= 32$ hundreds.

32 hundreds $+ 1$ hundred $= 33$ hundreds.

Then, $8 \times 423 = 3384$.

It is unnecessary to write the partial products in full when multiplying by a number of one figure.

Multiply \$4.23 by 8.

$8 \times 3¢ = 24¢ = 2$ dimes $+ 4¢$. Write 4.

\$4.23
8
\$33.84

8×2 dimes $= 16$ dimes. 16 dimes $+ 2$ dimes $= 18$ dimes $= \$1 + 8$ dimes. Write 8.

$8 \times \$4 = \$32$. $\$32 + \$1 = \$33$. Write 33.

Then, $8 \times \$4.23 = \$33.84$.

In writing amounts of money, what numbers does the decimal point separate? Why is it placed between 3 and 8 in the above result?

1. What is the cost of 6 desks at \$3.75 each?
2. What is the cost of 7 hat-racks at \$12.25 each?
3. What is the cost of 8 dictionaries at \$9.50 each?

4. \$1.05 ×9	5. \$18.75 ×9	6. \$25.00 ×6	7. \$12.85 ×3
8. \$45.05 ×6	9. \$45.65 ×5	10. \$42.80 ×8	11. \$37.12 ×4

NOTE.—The teacher will add as many such exercises as circumstances require.

Written.

1. Draw a rectangle to represent a garden 48 yards long and 24 yards wide. Divide it into 3 equal parts by lines running lengthwise.

2. The first plot is set with strawberry-plants a foot apart in rows a yard apart, running lengthwise, the outer plants being 1 yard from the boundary. How many plants are there in the plot?

3. The second plot is set with celery-plants 6 inches apart in drills a yard apart running lengthwise, the outer plants being 1 yard from the boundary. How many plants are there in the plot?

4. The third plot is set with raspberry-bushes 2 yards apart in rows 2 yards apart running lengthwise, the outer bushes being 2 yards from the boundary. How many bushes are there in the plot?

5. If the strawberry-plants yield 64 quarts per row during the season, how many quarts will the plot produce? How many bushels?

6. If the strawberries sell for \$3 a bushel, what is the value of the crop?

7. What is the cost of picking the whole crop at 50¢ a bushel? What is the profit?

8. If each row of celery-plants produces \$5 worth of celery, how much is the crop of celery worth?

9. If it costs \$2 a row to raise and market it, what is the profit?

10. If each row of raspberry-bushes yields a profit of \$6, what is the profit on the crop?

11. Which plot yields the largest profit?

1. $10\times4=$—. $10\times5=$—. $20\times4=$—. $20\times5=$—.

2. How is any integer multiplied by 10? 20 is how many times 10?

3. To multiply by 20 is to multiply by 10 and by what other number? Multiply by 20:

3, 18, 42, 36, 25, 122, 260, 700.

4. To multiply by 30 is to multiply by 10 and by what other number? Multiply by 30:

3, 5, 6, 8, 7, 4, 9, 16, 45, 27, 61.

5. How may one multiply a number by 40? 50? 60? 70? 80? 90? Multiply by 40:

3, 18, 42, 36, 25, 122, 260, 700.

87
35
435
2610
3045

6. To multiply 87 by 35 is to multiply it by 5 plus 30. What is the result of multiplying it by 5? How is it multiplied by 30? What is this result? What is their sum?

Multiply:

7. 84	8. 75	9. 60	10. 90	11. 42
12	15	12	25	32
12. 35	13. 42	14. 76	15. 83	16. 27
11	25	34	12	19

Does the zero at the right in the result of the second multiplication affect the product? It is customary to leave this place blank.

17. 25	18. 18	19. 19	20. 65	21. 77
×24	×14	×55	×48	×66

NOTE.—The teacher will add as many such exercises as circumstances require.

Building lots are usually bought and sold at a *price per foot* of the length of their frontage on the street. A lot with a frontage of 30 feet is called a *30-foot lot.*

To prevent misunderstanding the price is usually stated to be *per front foot.*

1. What is the width of the middle lot in the picture? What did it cost at $12 per front foot?

2. What is the width of the lot at the right? What did it cost at $22 per front foot?

3. What is the width of each lot at the left? What did each cost at $18 per front foot?

4. What is the value of the block of land shown in the picture, if the end lots are worth $3 per front foot and the others $2?

1. It costs 25¢ to telephone from Rochester to Syracuse, 3 minutes being allowed for conversation; 10¢ is charged for each additional minute. What does it cost to telephone 5 minutes from one of these cities to the other?

2. The cost of a telegram of 10 words (or less) between Syracuse and Rochester is 25¢ and 2¢ for each word above 10. (This rate is expressed thus: 25-2.) What would it cost to send the following message between these places?

Can not come this week; business prevents; arrive Syracuse Tuesday; will write.

3. What would it cost to telephone the message of Exercise 2?

4. What would it cost to send the following messages from Chicago to New York City at 40–3?

Suddenly called London; sail Celtic Saturday; meet me wharf without fail. Important.

Railway accident on Baltimore and Ohio. No one seriously hurt. Details later.

5. Write messages and find from the following table the cost of sending these between Chicago and:

Place	Rate		Place	Rate	
	Day	Night		Day	Night
San Francisco	75–5	75–5	Galveston, Texas	60–4	40–3
Detroit	25–2	25–1	Kansas City, Mo.	30–2	25–1
New York	40–3	30–2			
New Orleans	50–3	30–2			

Note.—Address and signature are free.

6. Make other problems using the rate from your city to several other places.

1. A church contains 165 pews, each of which will seat 4 persons; what is the seating capacity of the church?

2. A dealer exchanged 14 village lots worth $250 each for a house and lot. He sold the house and lot for $4,000; how much did he gain?

3. 4 cars loaded with wheat contain 800 bu., 960 bu., 728 bu., 696 bu., respectively. How many bushels are there in the 4 cars?

4. Fire destroyed a house worth $2,275. It was insured for $1,600. What was the loss to the owner?

5. What is the cost of 75 ft. of rope at 3¢ a ft.?

6. A hose-cart cost $375, a horse $175, and a harness $60; how much did the whole cost?

7. Four thousand nine hundred thirty-six is how many more than one thousand eight hundred sixty?

8. 4 casks of oil contain 52 gallons each; how many gallons are there in the 4 casks?

9. How many yards are there around a rectangular park 240 yd. long and 180 yd. wide?

10. If a stone walk costing $2 for every yard of length is built around the park of Exercise 9, how many dollars would it cost?

11. A car contains 120 barrels of apples. If each barrel contains 3 bushels, how many bushels of apples are there in the car?

12. Mr. Peters bought a 400-foot lot for $4,000. He divided it and sold the whole for $6,000. What was his selling price per foot? How much did he gain per foot?

DIVISION

Divisors of One Figure

An automobile traveled 42 miles in 2 hours; how many miles did it travel per hour?

Find $\frac{1}{2}$ of 42 miles. $42 = 4$ tens $+ 2$ units.

$\frac{1}{2}$ of 4 tens $=$ — tens. $\frac{1}{2}$ of 2 units $=$ — units.

This may be written: $\begin{array}{r} \text{2 tens + 1 unit} \\ 2\overline{)\text{4 tens + 2 units}} \end{array}$, or $\begin{array}{r} 21 \\ 2\overline{)42} \end{array}$.

The automobile traveled 21 miles per hour.

$\frac{1}{2}$ of $42 = 21$ may be written $42 \div 2 = 21$.

In division the result is called the **quotient.**

A train traveled 78 miles in 3 hours; how many miles did it travel per hour? Find $\frac{1}{3}$ of 78 miles.

7 is not a multiple of 3. Of these multiples less than 8, 6 is the nearest to 8.

$$\begin{array}{r} \text{2 tens +} \quad \text{6 units} \\ 3\overline{)\text{7 tens + 8 units}} \\ \underline{6} \\ \text{1 ten + 8 units} = \text{18 units} \\ \underline{18} \end{array}$$

$\frac{1}{3}$ of 6 tens $=$ 2 tens. 1 ten remains to be divided. With the 8 units it makes 18 units. $\frac{1}{3}$ of 18 units $=$ 6 units.

Test: $3 \times 26 = 78$.

A simpler form of the work is $\begin{array}{r} 26 \\ 3\overline{)78} \end{array}$

The train traveled 26 miles per hour.

1. If a bicyclist rides 88 miles in 8 hours, what is his rate per hour?

2. How many miles does a train travel in $\frac{1}{4}$ of an hour, when running at the rate of 60 miles an hour?

Divide and test:

3. $2\overline{)42}$	4. $3\overline{)36}$	5. $4\overline{)44}$	6. $5\overline{)75}$
7. $4\overline{)56}$	8. $2\overline{)58}$	9. $6\overline{)78}$	10. $3\overline{)42}$

A steamer traveled 162 miles in 9 hours; how many miles did it travel per hour?

Find $\frac{1}{9}$ of 162 miles. 162 = 1 hundred + 6 tens + 2 units.

1 being less than 9, there will be no hundreds in the quotient. Hence, 162 is taken as 16 tens + 2 units.

Thus, $\begin{array}{r} 1 \text{ ten } + 8 \text{ units} \\ 9\overline{)16 \text{ tens} + 2 \text{ units}} \end{array}$, or $\begin{array}{r} 18 \\ 9\overline{)162} \end{array}$

16 tens ÷ 9 = 1 ten and 7 tens yet to be divided.

7 tens and the 2 units make 72 units.

72 units ÷ 9 = 8 units.

Test: $9 \times 18 = 162$.

The steamer traveled 18 miles per hour.

1. How many hours does it take a coach traveling at the rate of 6 miles an hour to go 132 miles?

2. If a street-car travels 135 miles in 9 hours, how many miles does it go per hour?

3. If a postman walks 108 miles in 9 days, how many miles does he walk per day?

4. If an automobile travels from New York to Albany, 143 miles, in 8 hours, what is its rate per hour?

5. How many miles per hour does a steam-launch travel that goes 126 miles in 6 hours?

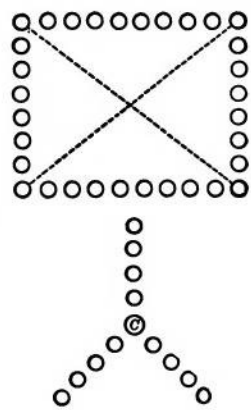
Divide and test:

6. $8\overline{)168}$	7. $4\overline{)124}$	8. $5\overline{)105}$	9. $3\overline{)186}$
10. $9\overline{)198}$	11. $7\overline{)231}$	12. $6\overline{)204}$	13. $5\overline{)165}$
14. $6\overline{)192}$	15. $8\overline{)248}$	16. $5\overline{)185}$	17. $7\overline{)154}$

NOTE.—The teacher will add as many such exercises as circumstances require.

1. A captain drilled 48 boys. How many boys were there in a row when he arranged them in 4 equal rows? In 8 equal rows? In 12 equal rows? In 2?

2. He also arranged them as shown in the figure, 8 boys at each end, 10 on each side, and the rest in two equal cross-lines; how many were there in each cross-line?



3. In one part of the drill the captain arranged the boys in 3 lines like the spokes of a wheel with himself as the center; how many boys were there in each line?

4. He arranged the boys in 6 lines in the same way; how many were there in each line?

5. 176 pupils of a school march in 4 equal columns; how many pupils are there in each column?

6. If there are 84 men in a certain company of soldiers, into how many squads of 7 each can the captain divide the company? Make and solve 3 similar problems.

45 boys choose sides for a game. How many boys are there on a side? How many are left out?

$45 = 40 + 5$.

$\frac{1}{2}$ of 4 tens (40) = 2 tens (20).

$\frac{1}{2}$ of 4 units = 2 units.

$$\begin{array}{r|l} 2 & 40 + 5 \\ \hline & 20 + 2 \\ & 40 \\ \hline & 5 \\ & 4 \\ \hline & 1 \end{array} \quad \text{or} \quad \begin{array}{r|l} 2 & 45 \\ \hline & 22 \\ & 40 \\ \hline & 5 \\ & 4 \\ \hline & 1 \end{array}$$

The result of dividing 45 by 2 is 22 and a remainder 1.

Test: $2 \times 22 = 44$.
$44 + 1 = 45$.

There are 22 boys on a side and 1 left over.

From 79 boys 5 equal groups are made as large as possible. How many are there in each group? How many are left over?

$$\begin{array}{r|l} 5 & 70 + 9 \\ \hline & 10 + \quad 5 \\ & 50 \\ \hline & 20 + 9 = 29 \\ & 25 \\ \hline & 4 \end{array} \quad \text{or} \quad \begin{array}{r|l} 5 & 79 \\ \hline & 15 \\ & 50 \\ \hline & 29 \\ & 25 \\ \hline & 4 \end{array}$$

Test: $5 \times 15 = 75$.
$75 + 4 = 79$.

7 is not a multiple of 5. Of these multiples 5 is the only one less than 7.

5 tens (50) ÷ 5 = 1 ten (10).

29 is not a multiple of 5; of the multiples of 5 less than 29, 25 is the nearest to 29.

25 units ÷ 5 = 5 units.

The result of dividing 79 by 5 is 15 and a remainder 4.

There are 15 boys in each group and 4 left over.

1. A gardener sets out plants 4 in a row. How many rows did he set with 138 plants? How many plants are left?

2. How many 3-bushel barrels can be filled from 173 bu. of apples? How many bushels are left?

Written.

1. A farmer had \$75, and spent $\frac{1}{5}$ of it for a plow and twice as much for a roller; he spent \$—.

2. The pay-roll of a department having 7 employees is \$98 a week. This is how many dollars per employee?

3. When Charles has read $\frac{1}{8}$ of a 200-page book, how many pages are there left to read?

4. A machinist earned \$144 a month and paid $\frac{1}{3}$ of it for rent and $\frac{1}{8}$ of it for other bills. How many dollars did he pay for rent? How many dollars did he use to pay the other bills?

5. A well 96 feet deep goes through rock $\frac{1}{8}$ of the way. What did it cost to bore the well at \$1 a foot for rock and \$$\frac{1}{4}$ a foot for the rest?

6. The sales in a department store for one day amounted to \$1,260, $\frac{1}{5}$ of which was received by the book department, and $\frac{1}{3}$ by the dry-goods department. How many dollars were received by the other departments altogether?

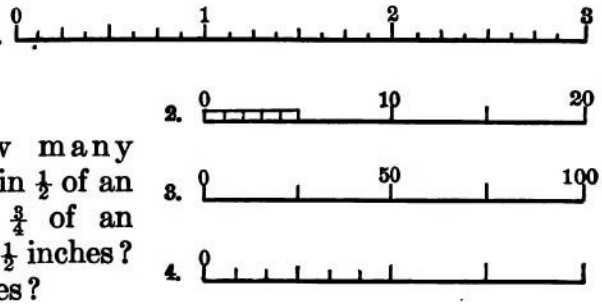
7. A contractor received \$1,768 for paving a street; $\frac{1}{8}$ of this was profit. How many dollars did he make?

8. 966 tons of coal arrived at a coal-yard in one day, $\frac{1}{6}$ of which was soft coal; how many tons were hard coal?

9. A house and lot cost \$2,870; $\frac{1}{7}$ of this was the cost of the lot. What was the cost of the house?

10. A dealer gave an order for 4-dollar cameras. The bill was \$576. How many did he buy?

1. Line 1 is how many inches long? Into how many equal parts is each inch divided? Each division is what part of an inch?



2. How many such parts in $\frac{1}{2}$ of an inch? In $\frac{3}{4}$ of an inch? In $1\frac{1}{2}$ inches? In $2\frac{1}{2}$ inches?

3. Line 2 is how many inches long? If each inch stands for 10 equal divisions, how many of these parts in $\frac{1}{2}$ of an inch? How many in $1\frac{1}{2}$ inches? In $\frac{3}{4}$ of an inch?

4. Line 3 is how many inches long? If each inch stands for fifty equal divisions, how many of these parts in $\frac{1}{2}$ of an inch? In 2 inches? In $1\frac{1}{2}$ inches? In $\frac{4}{5}$ of an inch?

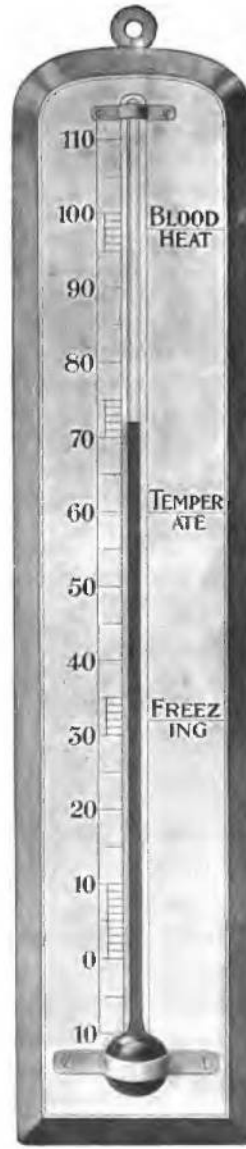
5. Line 4 is how many inches long? If each inch stands for 6 equal divisions, how many such divisions are there in $\frac{1}{2}$ of an inch? In $\frac{1}{3}$ of an inch? In $\frac{2}{3}$ of an inch? In $1\frac{2}{3}$ inches?

6. Draw a line 6 inches long; mark one end 0, its mid-point 60, and the other end 120. For how many divisions does 1 inch stand? 2 in.? $\frac{1}{2}$ in.? 5 in.?

7. If an inch on a map stands for 10 miles, how far apart are two cities that are 3 inches apart on the map? If the length of a railroad is represented by $17\frac{1}{2}$ inches, how many miles in its length?

The picture at the right represents a thermometer. The heavy black line represents the mercury, which rises in the glass tube whenever the temperature becomes warmer and falls whenever the temperature becomes cooler. The scale at the side tells how high the mercury is above a starting-point called the zero point, and each division is called a **degree.**

The symbol for degree is °. Thus, 4 degrees is written 4°.



1. How high does the mercury stand in the thermometer in the picture?

2. The point marked freezing is how many degrees above the 0 point? When the mercury stands at the freezing point water freezes and forms ice.

3. How many degrees above zero does the mercury stand when the temperature is called temperate? When the temperature is called blood heat?

4. How many degrees does the mercury rise in passing from freezing to temperate?

5. How many degrees are there between temperate and blood heat? Between freezing and blood heat?

The amount of a hardware bill was \$19.85, $\frac{1}{5}$ of which was profit; how many dollars did the merchant make?

Find $\frac{1}{5}$ of \$19.85, or divide \$19.85 by 5.

$$5\overline{)\$19.85}\quad\$3.97$$

\$19 = 5 × \$3 and \$4 besides.

The \$4 left to be divided and the 8 dimes of the given amount make 48 dimes.

48 dimes = 5 × 9 dimes and 3 dimes besides.

The 3 dimes left and the 5¢ of the given amount make 35¢. 35¢ = 5 × 7¢.

The solution may be expressed thus:

$\frac{1}{5}$ of \$19.85 = \$3.97, or \$19.85 ÷ 5 = \$3.97.

1. If a man earns \$25.20 per week and saves $\frac{1}{4}$ of his earnings, how many dollars does he save? If he pays $\frac{1}{6}$ of his earnings for board, how many dollars does his board cost him?

2. A week's pay for 8 men receiving equal salaries is \$70.80; what is the weekly salary of each?

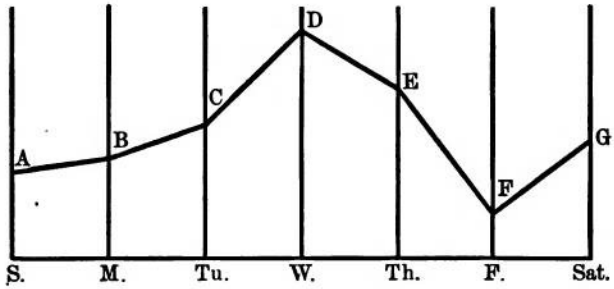
3. A man who earns \$12.60 a week pays $\frac{1}{6}$ of this amount for board; how many dollars does his board cost him?

Divide:

4. $5\overline{)\$36.50}$	5. $9\overline{)\$45.90}$	6. $8\overline{)\$36.24}$
7. $7\overline{)\$49.49}$	8. $6\overline{)\$18.36}$	9. $6\overline{)\$24.48}$
10. $5\overline{)\$5.55}$	11. $5\overline{)\$10.00}$	12. $3\overline{)\$66.60}$
13. $4\overline{)\$96.04}$	14. $8\overline{)\$64.32}$	15. $7\overline{)\$14.49}$

NOTE.—The teacher will add as many such exercises as circumstances require.

1. Draw a horizontal line 6 inches long and draw above it vertical lines 1 inch apart and 3 inches long,



arranged as shown in the figure. Suppose the thermometer reads for the seven consecutive mornings of a week as follows:

S.	M.	Tu.	W.	Th.	F.	Sat.
20°	30°	35°	60°	40°	10°	30°

Mark a point 1 inch upward on the first line and let this distance represent 20°.

2. How many inches laid off on the second line will represent 30°? Mark a point on the line B to show this.

3. How many inches must be laid off on the third line to represent 35°? Mark and letter the point that corresponds to the temperature for each day.

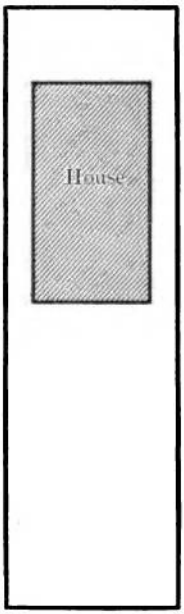
4. Connect A, B, . . . G in order by straight lines.

This broken line is called a **temperature line.** The oftener the temperature is read and recorded, the nearer this line comes to being a smooth curve.

5. At what point is the temperature line highest? On what day of the week was the temperature the lowest? How does the line show this?

Material: Rules graduated in eighths of an inch

1. In the plan of the house and lot, 1 inch represents 32 feet. How many feet does $\frac{1}{2}$ of an inch represent? $\frac{3}{8}$ of an inch? $\frac{5}{8}$ of an inch?



2. Measure the length of the drawing. How many inches long is it?

3. How long is the lot represented in the drawing?

4. How many inches wide is the drawing? How wide is the lot represented by the drawing?

5. How many feet long is the house? How many feet wide?

6. How many feet is the front of the house from the street? How many feet is the back of the house from the back of the lot?

7. Add the distances found in Exercise 6 to the length of the house. What length should this sum equal? Does it equal it?

8. How long is the fence around the lot?

9. If the front fence cost \$2 per foot of length, what did this fence cost? If the rest of the fence cost \$$\frac{1}{6}$ a ft., what did this part cost? The whole fence?

10. What is the cost of a sidewalk in front of the lot at \$$\frac{1}{4}$ per foot of length?

11. Make other plans to scale and answer similar questions about them.

1. Find your pulse. Count its beats for 1 minute while you are sitting still. How many times would it beat in an hour at this rate? In $1\frac{1}{2}$ hours?

2. Walk rapidly around the room. Count the pulse-beats now. Answer the same questions as in Exercise 1.

3. How many more beats are there in a minute immediately after walking than in a minute when sitting still? What would be the difference in an hour?

4. While sitting still count the number of times you inhale in a minute. How many times will you inhale in an hour at this rate?

5. Walk rapidly around the room. Count the number of respirations now. Answer the same question as in Exercise 4.

6. How many more respirations are there per minute after walking than before?

7. How many pages has this book altogether?

8. How many pages are there exclusive of the table of contents and index?

9. How many pages have you already studied? How many pages must you still take to finish the book?

10. If you were to take 4 pages a week, how many pages would you take in 10 weeks?

11. How many weeks would be needed to take 60 pages? 70 pages?

12. Make some problems like the preceding about some book that you are reading at home.

OPERATIONS WITH 10 AND 100

Multiplication and Division by 10

1. Count by tens from 10 to 200.

2. Write the multiples of 10 from 10 to 200.

3. In what figure do all of these multiples end?

4. 40 is how many times 4? 70 is how many times 7? Place a zero at the right of 13. The result is how many times 13?

5. By what number is 4 multiplied by placing 0 at the right?

6. Find 10×7; 10×9; 10×13; 10×15; 10×20; 10×35; 10×36; 10×70; 10×75; How is 10 times any number found?

7. How may a multiple of 10 be divided by 10?

8. Find $\frac{1}{10}$ of 950; of 670; of 890; of 730.

9. $290 \div 10 = $ —. $520 \div 10 = $ —.

10. $\$980 \div 10 = \$$—. $\$760 \div 10 = \$$—.

11. $1{,}050 \div 10 = $ —. $6{,}350 \div 10 = $ —.

12. $\$9{,}490 \div 10 = \$$—. $\$9{,}900 \div 10 = \$$—.

13. 500 bushels of potatoes are divided into 10 equal parts; how many bushels are there in each part?

14. If a machine thrashes 90 bushels of barley in a day, how many bushels will it thrash in 10 days? In 50 days?

15. An orchard contains 45 rows of trees with 10 trees in a row; how many trees are there?

16. If a military company contains 100 men, how many men are there in $\frac{1}{10}$ of the company?

1. How many cents in \$1? In \$10? How many dollars in 1,000 cents?

2. Count by 100s to 1,000. How many hundreds in 1,000?

3. How many dollars are there in 1,200 cents? How many hundred cents? How many hundreds are there in 1,200?

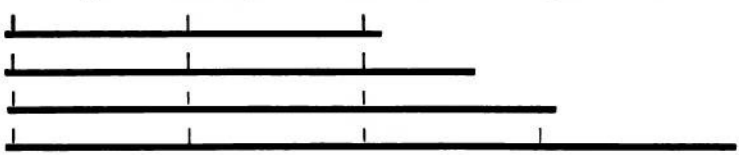
4. By what number is 15 multiplied by placing 00 at the right?

5. $100 \times 8 = —$. $100 \times 29 = —$. $100 \times 76 = —$. $100 \times 35 = —$.

6. What is $\frac{1}{100}$ of a dollar? What is $\frac{1}{100}$ of \$10 or of 1,000 cents?

7. What is $\frac{1}{100}$ of 1,200 cents? What is $\frac{1}{100}$ of 1,200?

8. If 1 space represents 100 miles, how many miles are represented by each of the following lines?



9. If 100 miles are represented by 1 inch, how long are the lines that would represent the lengths of the following rivers?

Amazon,	3,300 miles.	Rhine,	400 miles.
Mississippi,	2,300 "	Seine,	700 "
St. Lawrence,	1,900 "	Hudson,	300 "
Columbia,	1,000 "	Thames,	200 "

10. Draw lines to represent these lengths.

1. What is the cost of 100 square feet of cement walk at \$.17 per square foot?

2. What is the cost of 10 harnesses at \$43.75 each?

3. What is the cost of 100 feet of copper wire at 3 cents a foot? What is the cost of 500 feet? Of 800 feet? Of 100 yards?

4. What is the cost of 100 geographies at \$.30 each? What is the cost of 300? Of 500? Of 900?

5. What is the cost of 20 typewriters at \$60 each?

6. When 200 barrels of apples cost \$400, what is the cost of 1 barrel at the same rate? Of 40 barrels?

7. What is the cost of 10 sets of encyclopedias at \$75 a set?

8. A merchant sells 100 tops at \$.05 apiece, 100 balls at \$.10 each, and 10 kites at \$.25 each; what was the amount received from each sale? From all of the sales?

9. A man sold \$365 worth of goods and received $\frac{1}{10}$ of the amount for selling them; how many dollars did he receive?

10. Mary bought 10 yards of linen at \$.75, 100 skeins of silk at \$.03 a skein, and 10 yards of ribbon at \$.36 a yard; how much did she pay for each purchase? How much did she pay for all?

11. The first-class freight rate from Chicago to Denver is \$2.05 per 100 pounds. What is the cost of shipment of 10 hundred pounds? Of 700 pounds?

12. When the rate is \$.65 per hundred pounds, what is the charge on 1,000 pounds? On 15 hundred pounds? On 2 thousand pounds?

DIVISION

Divisors of Two Figures

How many dozen cans of peas in a lot of 566 cans? Divide 566 by 12.

	4 tens +	7 units	47
12)	56 tens + 6 units	or 12)	566
	48 tens		48
	8 tens + 6 units =	86 units	86
		84 units	84
		2 units	2

Test: $12 \times 47 = 564$. $564 + 2 = 566$.

Thinking of the products of 12×1, 12×2, . . ., one sees that 12 times 5 tens is more than 56 tens, and that 12 times 4 tens is less; write 4 tens in the result. Subtracting 48 tens from 56 tens 8 tens are left. With the 6 units, they make 86 units. 12 times 8 units is more than 86 units, but 12 times 7 units is less. Write 7 units as part of the result. Subtracting 84 units from 86 units 2 units are left.

The division of the remainder may be indicated by $\frac{2}{12}$ and the result be written $47\frac{2}{12}$ dozen.

When the multiples of the divisor are not well known, the figure to be used in the result must be found by estimate or trial. If this figure is taken *too large*, the number to be subtracted will be larger than that from which it is to be subtracted. Try a smaller figure. If the figure is too small, the difference in the subtraction will be larger than the dividend. In this case take a larger figure in the result.

1. How many 45-ton car-loads can be loaded from 512 tons of coal? How many tons are left?

2. How many 18-ton car-loads of cabbage and how many tons besides are there in 311 tons?

1. If 38 men working for the same wages earn $76 per day, what does 1 man earn per day? 30 men?

2. If 19 hats cost $47.50, what does 1 hat cost? How many can be bought for $12.50?

3. If 22 duck coats cost $43.12, find the cost of one; of 18.

4. If 2 dozen pairs of gloves cost $28.08, what is the price per pair? What is the cost of 68 pairs?

5. If shoes cost $15.00 per case of 12 pairs, what is the price per pair?

6. If 61 copies of a book cost $50.63, what is the price per copy? What is the cost of 75 copies?

Find the price per dozen, if—

7. 16 dozen lemons cost $4.96.

8. 59 dozen cans of corn cost $53.10.

9. 15 dozen cans of dried beef cost $18.

10. 45 dozen cans of tomatoes cost $48.60.

11. 37 dozen bottles of catsup cost $31.45.

12. 25 dozen packages of wafers cost $15.

13. 15 dozen cakes of chocolate cost $12.60.

14. 36 dozen packages of yeast-cakes cost $27.00.

Find the price of 1, *when—*

15. Hats cost $18 per dozen.

16. Shirts cost $9.60 per dozen.

17. Collars cost $3.60 per box of 24.

18. Neckties cost $31.20 per lot of 48.

The following are wholesale prices of various fruits:

California prunes,	6 lb. for $1.	Apples in 25 lb. lots,	$3.50.
Pears,	6 lb. for $1.	Apricots in 25 lb. lots,	$4.75.
Peaches,	9 lb. for $1.	Currants in 20 lb. boxes,	$4.00.
Plums,	7 lb. for $1.	Raisins in 50 lb. boxes,	$4.75.

1. What price per pound does the customer pay for each of the above articles at the rate quoted?

2. A retail grocer buys 275 lb. of apples at the price quoted above; how much do the apples cost?

3. He also buys 216 lb. of pears, 497 lb. of plums, and 90 lb. of currants; how much do these cost?

4. A dealer bought 75 lb. of apples at the price quoted above. He sold 45 lb. at 18 cents a lb. and the rest at 16 cents a pound; how much did he make?

5. Make and solve 5 other problems about fruits.

6. A family bought a 16 qt. crate of strawberries for $2.56; how much was this per quart?

7. It took a dozen cans at 48¢ and 6 lb. of sugar at 5½¢ a lb. to can the berries; what did the cans and sugar cost? What was the total cost per can?

8. If the family could have bought a dozen cans of fruit at the store for $4.00, how much did they make by canning the berries for themselves?

9. 4 dozen pint glasses of jelly cost a baker $26; how much was this per pint?

10. A grocer bought peaches at $15 per hundred cans, and sold them at 20¢ a can; how much did he make on 100 cans? On 1,000 cans?

1. If packages of 12 bottles each are made from 560 bottles of ink, how many packages are made and how many bottles are left?

2. A baker has a cake-pan that holds 10 cakes each way; how many cakes are there in a panful?

3. What do 12 dozen cakes cost at 12¢ a dozen? How much do 100 cakes cost at the same rate?

4. Arthur made a rack for a clematis-vine. There were 5 slats as in the picture, the bottom one being 2 ft. long, the next 22 in., the next 2 in. less, and so on to the top. He cut them from a strip 10 ft. long; how many inches were left?

5. The slats of the rack were 2 inches wide and 18 inches apart, those at the top and bottom were 6 inches from the ends of the rack. How long was each side-piece of the rack?

6. A grocer bought $5\frac{1}{2}$ dozen eggs at 16¢ a dozen and sold them for 20¢ a dozen; how much did he make? What is the shortest way of solving this problem?

7. Roy bought 32 boxes of berries at 8¢ a quart and sold $\frac{3}{4}$ of them at 12¢ a box, and the rest at 9¢; how much did he gain?

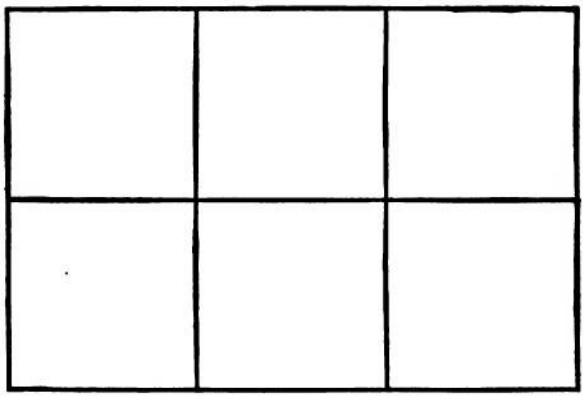
8. The freight rate from Buffalo to Chicago on a certain class of articles is 65¢ per 100 lb.; what is the freight charge on 1,800 lb. of these goods?

APPLICATIONS OF PROCESSES

Measurement of Area

1. How many square inches (sq. in.) in the first row of this rectangle? In each row? In both rows?

$2 \times 3 \times 1$ sq. in. $=$ — sq. in.



2. The size of any surface is called its **area.** How many square inches in the surface of the rectangle in the figure? What is its area?

3. What is the area of a rectangle 4 inches by 8 inches?

$4 \times 8 \times 1$ sq. in. $=$ — sq. in.

4. The **number of units of area** in a rectangle is the same as the **product** of what two **numbers**?

5. What is the area of a rectangle 8 inches long and 6 inches wide?

State the areas of the following rectangles:

6. 4 in. by 5 in. 7. 8 in. by 9 in. 8. 6 ft. by 7 ft.
9. 9 yd. by 10 yd. 10. 8 ft. by 7 ft. 11. 6 in. by 9 in.

1. The distance around a figure, or the sum of the lengths of its sides, is called its **perimeter.** What is the perimeter of a rectangle 4 in. by 8 in.?

2. What is the perimeter of a 4-inch square? Of a square containing 16 square inches?

3. What is the perimeter of a rectangle 6 in. by 7 in.? 8 in. by 20 in.? 9 in. by 6 in.? 4 in. by 10 in.?

4. If a square yard is divided into square feet, how many are there in each row? How many rows are there?

5. How many square feet are there in a square yard?

6. A flower-bed is a yard square. It is divided into square feet, and a plant set at each corner of each square foot. How many plants are required?

7. Those along the border of the bed are foliage plants and those within are geraniums. How many of each kind of plants are required?

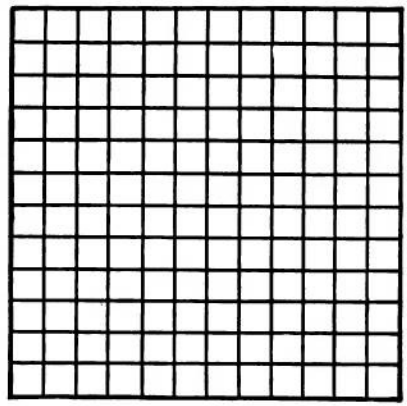
8. Make a drawing of the flower-bed mentioned in Exercise 6. Mark the positions of the plants, and designate the two kinds by circles and crosses or by colors.

9. Find the area of the lot shown on page 178.

10. Find the area of the surface covered by the house. How many square feet are not covered by the house?

11. What would it cost to grade and sod the part not covered by the house at 4 cents per square foot?

1. How many squares in each row of the figure? How many rows in it?



2. How many inches in a foot?

3. How many inches in each side of a square foot?

4. If a square foot is divided into square inches, how many in each row? How many rows are there?

5. How many square inches in one square foot?

144 square inches (sq. in.) = 1 square foot (sq. ft.).

6. How many square inches in $\frac{1}{2}$ of a square foot? In $\frac{1}{4}$ of a square foot? In $\frac{3}{4}$ of a square foot?

7. The floor of a room is 12 feet by 18 feet. The room is — yards long and — yards wide. What is the area of the floor? How many yards of carpet 1 yard wide will be needed to cover the floor?

8. If the carpet is laid the long way of the room, how many strips will be needed? How much will it cost to carpet the room at 40 cents a yard?

9. Make a drawing to show the floor and the strips of carpet for each part of Exercise 8. If $\frac{1}{2}$ of an inch in the drawing represents a 1-foot length on the floor, what will be the length and breadth of the drawing?

10. How many square feet in the area of a rug 48 inches wide and 9 feet long?

Written.

1. How many photographs 4 inches by 5 inches can be mounted in an album of 32 pages, the mounting surface of each page being 8 inches by 10 inches?

2. If the 25 envelopes of a package, each envelope being 4 inches by 6 inches, were placed end to end, what would be the length of the rectangle so formed?

3. How long would it be if the envelopes were placed side by side? What would be its area?

4. What would be the length and breadth of the rectangle formed by arranging the envelopes 5 each way? What would be its area?

5. How many tiles 4 inches by 6 inches are needed to cover a square yard of floor space?

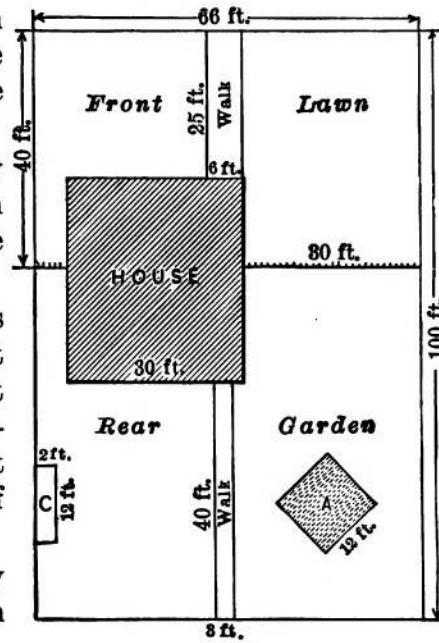
6. How many tiles 2 inches by 6 inches are needed to fill in the front of a mantel 2 feet by 3 feet?

7. A room has 3 doors, each 3 feet wide and 8 ft. long, and 5 windows each 3 ft. wide and 9 ft. long; how many square feet of openings in the walls of the room?

8. A room has 6 windows; each window has 2 panes, each pane being 24 in. wide and 36 in. long. What is the area in square feet of all the panes in one window? How many square feet of glass in the 6 windows?

9. How many square yards in the area of the court in the picture?

10. What will it cost to sod a lawn 28 ft. long and 5 yd. wide, the sod costing 5¢ for a piece 1 ft. wide and 3 ft. long; and 6 hr. of labor at 20¢ an hr. being required?



1. Find the length of the house from the length of the lot and the lengths of the walks.

2. How many square feet are there in the ground-plan of the house?

3. How many yards long is the fence that separates the front lawn from the rear garden? What did it cost at 35¢ per yard of length?

4. How many square yards in each walk?

5. If the front walk is made of cement at 90¢ a square yard, what is its cost?

6. If the rear walk is built of wood for 18¢ per foot of length, what is its cost?

7. A and C are flower-beds, A being square. Find how many square feet each occupies. How many square feet in both of them?

8. The bed A is fenced with woven wire 1 yard wide. How many yards of wire in the fence? What did it cost at 15¢ a yard?

9. If this bed is set with plants in 11 rows of 8 plants each, how many plants are there in the bed?

1. Find the area of the ceiling of the room.

2. How many strips of paper $1\frac{1}{2}$ feet wide are needed to cover a space 1 yard wide? If such strips are run the short way of the ceiling, how many strips will it take to cover it?

3. If 3 of these strips can be cut from a roll of paper so as to match, how many rolls of paper are needed for the ceiling?

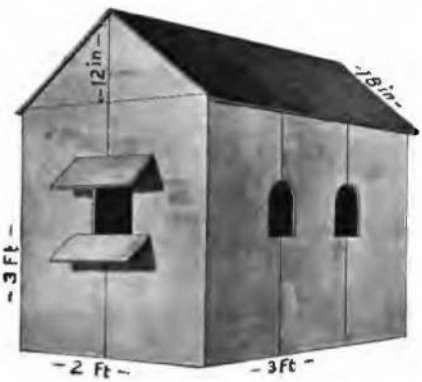
4. How many yards are there in the perimeter of the room? How many strips of paper are needed to cover all of the side-walls? Deduct $\frac{1}{4}$ for windows and doors; then how many strips are needed?

5. If a roll of paper cuts 5 strips so that they will match, how many rolls are needed for the side-walls?

6. What does the paper cost at $\$1\frac{1}{2}$ a roll?

7. If the decorator charges $\$\frac{1}{8}$ a roll for hanging the paper, how much does the work cost? What is the total cost?

1. George and Willard built a dove-cot of boards 1 foot wide, as shown in the picture. How wide was it? How long?



2. To build a cot like this, how many feet of inch-boards are needed for 1 side? For the two sides?

3. How long are the boards which form one end? Consider the corners cut off as waste. How many square feet of boards are needed to make the ends?

4. What is the size and shape of the floor of the cot? Draw this figure and find how many feet of boards are needed to make the floor.

5. How many inches wide is one side of the roof? How many feet long is it? How many square feet of boards are needed for the sides of the roof?

6. Allowing 2 sq. ft. for the door pieces and for waste, how many square feet of lumber are needed for the cot? What will it cost at 2¢ a foot?

7. If the rest of the materials are 2 pounds of nails at 3¢ a pound and a 20-cent can of paint, what is the total cost of the materials?

8. The boys bought 4 doves at 15¢ each; the next year they sold eight young doves at 12¢ each. How much did they make after deducting the cost of the old doves?

Oral.

1. If one pound of nails costs 3 cents, what will 10 pounds cost? 5 lb.? 20 lb.? 15 lb.? 25 lb.? When 50 lb. cost $1.50, what is the price per pound?

2. There are 100 pounds in a keg of nails; how many pounds are there in 5 kegs? What is the cost of a keg of nails at 3 cents a pound? What is the cost of 3 kegs? Of 5 kegs? Of 10 kegs? When 30 pounds of nails cost 90¢, what is the cost per pound?

3. When a dozen 2-quart pans sell for $1.20, what is the cost per pan? What will 10 pans cost at the same rate? What will $\frac{1}{2}$ of a dozen cost?

4. Many things are measured in length only, irrespective of width, as ribbon, cloth, woven wire, netting, etc. In such cases, a foot of length is often called a **running foot**. When woven wire sells at 9¢ a running foot, what is the cost of 10 feet? Of 100 feet? If it costs $18 at this price to fence a rectangular lot, what is the perimeter of the lot in feet?

5. How many things are there in a dozen? There are 12 dozen in a **gross**. How many things are there in a gross? 6 dozen are what part of a gross? 72 things are what part of a gross? 96 things are what part of a gross?

6. When screws are 96 cents a gross, how much are they per dozen? What would $\frac{2}{3}$ of a gross cost at the same rate? When screws are 10 cents a dozen, how much are they per gross?

7. What is the cost of 10 boxes of roofing tin at $8 a box? Of 20 boxes? Of 35 boxes?

1. Oliver has charge of a newspaper route having 40 customers; how many papers does he deliver in a month of 26 days?

2. If each customer pays 50 cents a month for his paper, how much does the newsdealer get per month from this route?

3. If Oliver gets 15 cents a day for his work, how much does he get per week? Per month?

4. How much is left for the dealer after having paid the newsboy?

5. If the paper costs the dealer 1 cent per copy, what is his profit on this route per month?

6. What would be the profit on 5 such routes yielding the same profit?

7. If Oliver also takes care of 3 sidewalks, receiving 15 cents a week for each, what does he receive in a month for cleaning walks?

8. If he does 5 errands per week at 5 cents each, how much does he earn in a month in this way?

9. How much does Oliver earn in a week from his three kinds of work? How much does he earn in a month?

10. If he buys himself a suit of clothes costing $4.00, how much has he left out of his month's earnings?

11. If he spends only $2.40 a month for clothing, shoes, books, and sundries, how many dollars does he save in 6 months?

12. Name three things that a girl can do and state how much she can earn in a week; in a month.

1. Brazilian rubber costs 35¢ a lb. ready for shipment; it sells for 88¢ a lb. in New York. What is the profit, except for the cost of shipment, on 325 lb.?

2. The forests of the Para Rubber Company average 6 rubber-trees to the acre; how many trees are there on 525 acres?

3. If a rubber-tree yields 3 pounds per season, and the market value is 75 cents a pound, what is the product of 1,000 such trees worth?

4. The average yield of a coffee-tree is 6 pounds a year, and the life of a tree is 35 years; how many pounds will a tree produce? What is the total product of a tree worth at 14 cents a pound?

5. If an acre grows 600 coffee-trees, what is the yield for one year at the rate given in Exercise 4? What is the value of this yield?

6. Allspice is ground from the berries of the pimento-tree. A single tree often produces 100 pounds of berries in a season. What is the product of one tree worth at 15¢ a pound? How much would the product of 75 such trees be worth?

7. The usual lifetime of a clove-tree is 80 years, and the yield per year is $7\frac{1}{2}$ lb. At this rate, how many pounds would a tree yield during its whole lifetime? What is this product worth at 14¢ a pound?

8. If the yield of 275 clove-trees is 8 lb. per tree for one season and the cloves are sold for 16¢ a pound, what is the value of the season's product?

9. Make and solve 3 problems about an apple-orchard.

1. How far does a boat traveling 312 miles a day go in 11 days?

2. A train leaving Buffalo at 9:50 in the morning and reaching New York at midnight of the same day is how many hours on the way?

3. A boat leaves Buffalo at 4:30 P. M. and arrives in Detroit at 7 A. M. the following morning. It leaves Detroit that day on the return trip at 4 P. M. and reaches Buffalo at 7:30 A. M. How many hours does it take to make the round trip?

4. When the fare from Buffalo to Chicago, a distance of 536 miles, is $10.72, what is the rate per mile?

5. Some steamers travel from New York to Havana, 1,413 miles, in 3 days. What is the rate of travel per day?

6. Some steamers travel from New York to London in 9 days. Taking the distance to be 3,375 miles, what is the rate of travel per day?

7. From the lengths of the Great Lakes given on page 148, find the number of miles from Buffalo to Chicago by water; also from Buffalo to Duluth; from Detroit to Chicago; from Buffalo to Detroit.

8. The steamship Western States travels 17 miles per hour between Buffalo and Detroit; according to Exercise 3, how many miles is it between these places?

9. From New York to Charleston, South Carolina, by water is 750 mi.; how many hours does it take a ship to make the voyage, if it travels 15 mi. per hr.?

10. From New York to Porto Rico is a 70-hr. voyage when traveling 20 mi. per hr.; how far is it?

Written.

1. One train carried 986 tons of coal, another 1,875, another 2,034, and another 1,458; how many tons did they carry altogether?

2. One lake vessel carries 1,385 tons of copper and its consort 800; how many tons do they both carry?

3. The six passenger-coaches of a train leave New York with 27, 69, 54, 47, 32, 18 passengers, respectively; how many passengers on the train?

4. Before the train arrives at Boston, 197 passengers get on and 213 get off at various stations; how many passengers does the train carry into Boston?

5. A train running 40 miles per hour would travel from New York to Buffalo in 11 hours; how many miles is it from New York to Buffalo?

6. From New York City to Albany is 143 mi., from Albany to Syracuse is 148 mi., from Syracuse to Rochester is 80 mi., from Rochester to Niagara Falls is 92 mi. How many miles from New York to Niagara Falls?

7. If a train running 40 miles an hour takes $1\frac{1}{4}$ hours to travel from San Francisco to San José, how far apart are these cities?

8. If a train 300 yd. long is running at the rate of 440 yd. per minute, how long is it in passing a station?

9. The distance from Chicago to Omaha is 491 miles, from Omaha to Denver is 571 miles, from Denver to San Francisco is 1,434 miles. Make and solve 3 problems involving these distances.

1. If a desk costs \$3.75, what will 5 desks cost? If each desk weighs 50 lb., how many hundred pounds in the weight of the desks? If the freight rate is 50¢ per 100 lb., what is the cost of shipment?

2. If a bill for 4 dictionaries is \$39.80, including \$1.80 expressage, what is the price per copy?

3. What is the cost of 8 copies of Black Beauty at \$.25 per copy, the expressage being \$.35?

4. What will one dozen copies of Lives of the Hunted cost at \$1.75 per copy?

5. If it takes 352 rails to lay one mile of track, how many will it take to lay 7 miles? 10 miles?

6. If a telegraph-line costs \$892 per mile, how much will 13 miles cost?

7. If it costs \$6 to lay 25 feet of gas-pipe, what will it cost to lay 500 feet at the same rate?

8. A carriage-wheel which is 4 yards around will turn how many times in going 1,760 yards, or 1 mile?

9. If it takes $4\frac{1}{2}$ yards of cloth to make a coat, $1\frac{1}{2}$ yards to make a vest, and $3\frac{1}{2}$ yards to make a pair of trousers, how many yards are required for the suit?

10. If an apartment-house contains 28 suites of rooms that rent for \$350 a suite annually, what is the total rent of the building per year?

11. The rents from the first floor of an apartment-house amount to \$225 a week; from the second floor, \$175; from the third floor, \$100; what is the total rent received per month?

12. What is the amount of rent received per day from the apartment-house mentioned in Exercise 11?

1. If a mason lays on plain work 1,200 bricks in a day, how many will he lay in a week of 6 days?

2. If a bricklayer laying 1,000 bricks per day receives $3 per day, how much does the laying of 4,500 bricks cost the builder?

3. A machine for making nails makes 60 every minute; how many does it make in an hour?

4. A machine, making screws worth $\frac{1}{4}$ of a cent each, makes 32 a minute. What is the value of an hour's product? Of 2 hours' product? Of 4? 8?

5. If a machine heads 4 rivets a minute, how many does it head in an hour?

6. If a machine weaves a yard of wire in 15 minutes, how many yards does it weave in 10 hours? What is the product worth at 25 cents a yard?

7. A man in a car-shop drives 100 nails for a cent. If he averages 30 nails a minute for 10 hours, how much does he earn per day of 10 hours?

8. A man worked 7 years in a mill at $40 a month and saved $850; what were his expenses per year?

9. The 100 largest cities of the United States contained $\frac{1}{8}$ of the total population of the country when the total population was 75 millions; what was the total population of the 100 cities?

10. A barrel of flour contains 196 lb. If 4 sacks fill a barrel, what is the weight of a sack? What is the weight of 25 barrels of flour?

11. What is the cost of a cement-walk 9 ft. wide and 80 yd. long at 90¢ per square yard?

1. What are the common units by which the weights of bodies are expressed? How many ounces in a pound?

The pound and the ounce, like all standard units of measurement, are authorized by the Government. Their weights are expressed by certain quantities of metal.

Bodies are often weighed by balancing known weights against them. This is done by means of a balance, as shown in the picture. It consists of a bar supported at the center, on each end of which is hung a pan. The body to be weighed is placed in one pan, and the weights in the other until the bar comes to rest in a horizontal position. The weight of the body is equal to the sum of the weights in the pan. Thus, in Figure 2, the sack of coffee weighs 1 pound and 1 ounce.

2. How many ounces are there in 4 pounds? In 5 pounds? In 8 pounds? In 18 pounds?

3. How many pounds are there in 32 oz.? In 96 oz.? In 128 oz.? In 160 oz.? In 336 oz.?

4. Express as lb. and oz.: 372 oz.; 829 oz.; 563 oz.; 284 oz.; 358 oz.

Find the cost of—

5. $5\frac{1}{2}$ lb. rice at 8¢ per lb.

6. $1\frac{3}{4}$ lb. of tea at 48¢ per lb.

7. 20 lb. of sugar at $4\frac{1}{2}$¢ per lb.

8. $2\frac{1}{2}$ lb. of coffee at 34¢ per lb.

1. If a balance is available, weigh several articles and make problems using their weights.

2. Clara bought 5 pounds of coffee at $.35 a pound, 15 pounds of sugar at $.06 a pound, and ½ a lb. of tea at $.60 a pound; how much did she pay for all?

3. A customer bought 4 lb. of butter at $.28 a lb., 7 lb. of lard at $.10 a lb., and 4 lb. of rice at $.11 a lb.; what did she pay for all?

4. 20 hundred pounds is called a **ton**; how many thousand pounds are there in a ton?

5. How many tons are there in 4,000 lb.? In 6,000 lb.? In 10,000 lb.?

6. 1,000 pounds are what part of a ton? 500 pounds are what part of a ton?

The rate of postage for letters is 2 cents per ounce or part of an ounce.

1. What is the postage on a letter weighing 2 oz. sent from San Francisco to New York?

2. What is the postage on a letter weighing $2\frac{1}{4}$ oz. sent to any part of the United States?

The rate of postage on books is 1 cent for each 2 oz. or part of 2 oz.

3. What does it cost to send a book weighing 8 ounces? To send 3 books, each weighing 14 oz.?

4. What is the postage on a book weighing 2 lb.?

5. If a package sent by mail at the rate of 1 cent an ounce costs 64 cents, how many pounds does the package weigh?

6. What is the postage on a 2-lb. package of books and a 2-lb. package of toys (postage 1¢ an oz.)?

If scales are available:

7. Weigh your arithmetic and state how much postage would be required to send it to Chicago.

8. Weigh other books and state the postage necessary to mail them.

9. Find by weighing some sheets of writing-paper and an envelope how many sheets of paper with the envelope can be sent for 2 cents.

10. What will be the postage on a letter containing 12 sheets of this paper?

11. Weigh several articles and state the postage at the rate of 1 cent per ounce or part of an ounce.

STARR'S General Market.

Grocery Department.

Sugar(with order)5 Pounds for	23c
Flour, the very best	52c
Potatoes, fancy Burbanks, Pk. 11c Bushel	43c
Navy Beans, Quart	6c
Shredded Wheat per packet	10c
Grape Nuts " "	10c
Washing Soda lb.	1c

APPLES
Northern Spies
Russets
Baldwins
20 oz. Pippins
Sweet Apples
Kings

PECK 19c.

Meat Market.

Native Roast Beef	10c
Leg Mutton	8c
Loin Mutton Chops	10c
Hind Quarter Spring Lamb	10c
Fore " " "	8c
Lamb Chops, rib or loin	14c
Swift's Branded Hams, per lb.	13c
3 lb. pail Leaf Rendered Lard	40c

From the price-list of the preceding page find the amount of each order in Exercises 1–4:

1. Flour, 1 sack. Sugar, 5 lb.
   Navy beans, 4 qt. Potatoes, ½ bu.
   Shredded Wheat, 2 pkg. Washing soda, 4 lb.

2. Flour, 2 sacks. Sugar, 10 lb.
   Grape Nuts, 6 pkg. Navy beans, 2 qt.
   Northern Spies, 3 pk. Shredded Wheat, 1 pkg.

3. Leg mutton, 5 lb. Leaf lard, 3 lb.
   Native roast beef, 2½ lb. Lamb chops, 2 lb.

4. Sugar, 10 lb. Leaf lard, 6 lb.
   Potatoes, ¾ bu. Roast beef, 3½ lb.
   Grape Nuts, 2 pkg. Swift's ham, 10 lb.
   Baldwin Apples, ½ bu. Leg mutton, 3½ lb.

5. 4½ pounds of roast beef cost how much more than 3 pounds of ham?

6. What is the cost of 2 full sacks and a half-sack of flour at the price quoted?

7. How many quarts of navy beans can be bought for 96 cents? What part of a bushel can be bought for 48 cents?

8. How many pounds of ham can be bought for 65 cents? How many pounds of mutton chops can be bought for 65 cents?

9. Make 3 orders of 6 items each and find the amount of each order.

10. Bring other price-lists and make problems from them.

1. A school gave a play and charged 15 cents admission. 450 tickets were sold. The expenses were $15. How many dollars were made?

2. Express companies make special rates to manufacturers. If a manufacturer can thus send a pair of shoes by express for 10¢ instead of the ordinary charge of 25¢, how much does he save on 100 pairs?

3. It costs 25¢ to send a telegram of 10 words from New York to Buffalo and 2¢ for each additional word; what is the cost of a 16-word message?

4. A steamer that consumes 4 hundred pounds of coal per mile uses how many hundred pounds on a trip of 300 miles? How many tons is this?

5. It costs 25¢ a word to cable from New York to London, what is the cost of a 25-word message?

6. In a 5-story building the floors are 15 feet apart and an elevator runs to the top story. If it goes up and down 50 times in a day, how many feet does it travel?

7. A barrel of flour weighs 196 pounds. If a sack of flour weighs 49 pounds, how many sacks of flour are there in a barrel? How many sacks are there in a car-load of 120 barrels?

8. If a gas-jet uses 7 cubic feet of gas per hour and a house has 15 such jets, how many cubic feet do they use in an hour? In an evening of 4 hours?

9. A mile contains 1,760 yards; how many feet are there in a mile? If there are 40 telegraph-poles to the mile, placed at equal distances apart, how many feet apart are the poles?

1. Mary buys at the store 2 bunches of radishes at 4 cents a bunch, 1 pint of pickles at 20¢ a quart, and 3 bars of soap at 5¢ a bar. How much change does she receive out of 4 dimes?

Make and solve 2 problems from each price-list below, using different amounts of each article :

2. Lace, 6¢ a yard.
Muslin, 20¢ a yard.
Buttons, 15¢ a dozen.

3. Insoles, 12¢ a pair.
Blacking, 15¢ a box.
Shoe-laces, 5¢ a pair.

4. Berries, 7¢ per qt.
Cookies, 9¢ " lb.
Bread, 5¢ " loaf.
Lettuce, 3¢ per head.

5. Lard, 12¢ per lb.
Sirup, 50¢ " gal.
Eggs, 18¢ " doz.
Oranges, 30¢ per doz.

6. Twist, 3¢ a spool.
Thread, 5¢ a spool.
Tape, 5¢ for 2 bunches.

7. Ink, 5¢ a bottle.
Pencils, 5¢ each.
Tablets, 8¢ each.

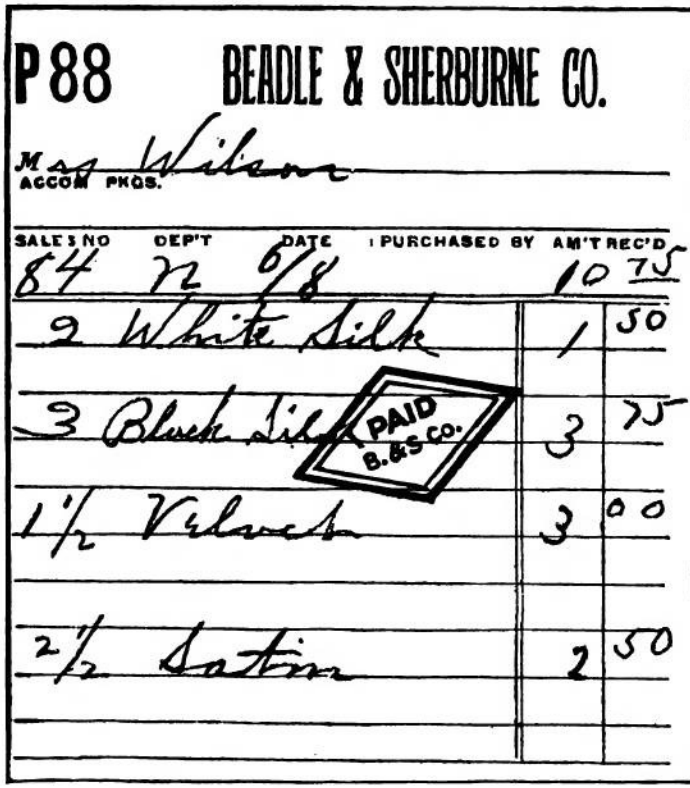
8. Rice, 8¢ per lb.
Peas, 15¢ per can.
Corn, 10¢ " "
Tomatoes, 12¢ per can.

9. Sugar, 6¢ per lb.
Coffee, 30¢ per lb.
Butter, 20¢ " "
Asparagus, 20¢ per can.

10. Calico, 5¢ a yard.
Silesia, 15¢ a yard.
Cambric, 8¢ a yard.
Canvas, 10¢ a yard.

11. Soda, 8¢ a lb.
Witch-hazel, 5¢ an oz.
Ammonia, 20¢ a pint.
Camphor, 5¢ an ounce.

12. Find the prices of several articles sold at the clothing-store. Make and solve 5 other problems.



P88 BEADLE & SHERBURNE CO.

Miss Wilson
ACCOM PKGS.

SALES NO	DEP'T	DATE	PURCHASED BY	AM'T REC'D
84	72	6/8		10 75
2 White Silk			1	50
3 Black Silk			3	75
1½ Velvet			3	00
2½ Satin			2	50

PAID B.&S. CO.

This is a **sales check** or memorandum of a customer's purchases.

1. What is the customer's name? The name of the firm?

2. The numbers at the left show the number of yards purchased; the amounts at the right indicate the cost of each article; what is the price of each article per yard?

3. What is the amount of the check?

1. In a department store it is customary to give a sales check with the purchases made in each department. A customer has 4 sales checks of the following amounts: \$2.50, \$1.75, \$.85, \$3.05. What is the total amount of the purchases?

2. Find the total of the following sales checks: \$3.65, \$2.18, \$1.05, \$.63, \$.38, \$3.17, \$4.00.

3. Make out a sales check, giving the name of the firm, of the customer, of the department, the date of sale, the articles sold with their values, and find the amount of the check.

4. The items of a sales check are:

4 silk, \$4.00; $\frac{1}{2}$ lace, \$1.50; $\frac{3}{4}$ velvet, \$1.50.

What is the price of each article per yard? What is the amount of the check?

5. The items of a sales check are:

Matches	25 cts.	Gelatine	15 cts.	Olives	50 cts.
Eggs	30 "	Bananas	13 "	Olive-oil	50 "
Celery	10 "	Wafers	15 "	Potatoes	40 "
Pineapple	20 "	Coffee	35 "	Lard	12 "

What is the amount of the check?

Class drill.

6. Several pupils act as salesmen for the various departments of a store, others as customers. The salesmen issue sales checks according to the purchases of the customers. The last salesman to whom the customer goes finds the total amount of the checks. The customer tests the accuracy of this reckoning. Cards bearing the names of articles for sale are convenient.

A bill is a statement of indebtedness. The indebtedness may be for things purchased or for services rendered. If for things purchased, it should contain a list of the articles purchased, the date of purchase, the quantity and price of the articles purchased, and the entire cost.

MARSHALL FIELD & COMPANY.

IMPORTERS, RETAILERS, MANUFACTURERS.

STATE, WASHINGTON, RANDOLPH & WABASH.

CHICAGO, AUG 1 1903.

SOLD TO
MR JOHN DOE
1017 STATE ST

4/4913

NOTICE—EXCHANGES TO BE CREDITED ON CURRENT BILL MUST BE RETURNED BEFORE THE LAST DAY OF THE MONTH.

JULY								
6	5	YDS SILK	95	4	75			
	4	SPOOLS THREAD	04		16	4	91	
13	2	PR RUBBERS	55	1	10			
	6	CAKES SOAP	08		48	1	58	
24	1	UMBRELLA				1	48	
						7	97	

RECEIVED PAYMENT
AUG 6 1903
MARSHALL FIELD & CO

1. In the above bill what is the date of purchase? Place? Who is the buyer? Seller?

2. Give the quantity, price, and cost of the first article; the second; the third.

3. What is the amount of the bill? when was it paid?

Procure or rule bill forms. Make out bills for the following, using your own name for buyer, and as seller some firm that deals in the goods to be billed. Fill out properly, find the amount, and receipt the bill :

1. 9 yd. lace, \$.35.
   6 yd. cotton, \$.16.
   3 spools thread, \$.05.

2. 3 bbl. flour, \$4.25.
   5 bu. potatoes, \$.65.
   40 heads cabbage, 6½¢.

3. 7 lb. rice, 9½¢.
   5 lb. sugar, 6½¢.
   10 lb. coffee, \$.45.

4. 6 pans, \$.25.
   3 pails, \$.50.
   18 lb. nails, 3¢.

5. 1 pair rubbers, 90¢.
   2 pairs shoes, \$4.50.
   1 pair slippers, \$2.50.

6. 16 bu. oats, \$.45.
   5 tons straw, \$3.00.
   10 tons hay, \$11.50.

7. 5 yd. lace, \$.15.
   2½ yd. silk, \$1.00.
   8 yd. woolen, \$.75.
   3 sticks braid, \$.06.

8. 4 bits, \$.15.
   1 saw, \$1.25.
   3 planes, \$.65.
   1 hammer, \$.35.

9. 15 bu. oats, \$.35.
   3 bales hay, \$1.50.
   2 bales straw, \$.45.
   4 hundred meal, \$1.25.

10. 5 lb. lard, \$.08.
    6½ lb. beef, \$.12.
    4 lb. sausage, \$.10.
    12 lb. butter, \$.18.

11. 2 lb. tea, \$.55.
    3½ bu. potatoes, \$.60.
    6 cans tomatoes, \$.12.

12. 1½ lb. candy, \$.40.
    2 qt. peanuts, \$.15.
    1½ gal. ice-cream, \$.80.

13. Why should a bill be dated? Why should it be receipted when paid? Why is it desirable to keep receipted bills?

1. A man plants a 6-acre field with cabbage and gets a yield of 16 tons per acre; how many tons of cabbage does he harvest?

2. He sells the cabbage for $5 per ton, loaded on the cars; what does he receive for the crop?

3. He draws the crop to the station in loads of 3 tons each; how many loads are there? What is the cost of cartage at $2.50 a load?

4. A car holds 16 tons; how many cars will be necessary to ship the crop?

5. It requires 5 thousand plants per acre to set the field; what is the cost of the plants at $1 per thousand?

6. What is the cost of growing the cabbage at $1.50 per ton?

7. The farmer who raised the crop payed $10 rent per acre for the land; what is his profit on the whole crop when all expenses have been paid?

8. If, instead of paying rent, he had worked the field on shares, furnishing everything at the same cost as before and receiving $\frac{1}{2}$ of the profits, how many dollars would he have made?

9. If he had sown the field with wheat, harvesting 30 bushels to the acre, what would the crop have been worth at 80 cents a bushel? If his profit is $\frac{1}{8}$ of this amount, which crop is the more profitable?

10. Find out how much corn an acre of land usually produces and the price of corn per bushel. What would the yield of a 6-acre field be worth? Find the probable value of a potato crop on 6 acres.

1. A family of three order from the grocery in one week: ½ bushel of potatoes at 60¢ a bushel, 1 sack of flour for 75¢, 10 pounds of sugar at 6¢ a pound, 4 pounds of butter at 25¢ a pound, 2 pounds of lard at 10¢ a pound, 2 dozen eggs at 20¢ a dozen, 1 pound of coffee at 40¢ a pound, and ½ of a pound of tea at 60¢ a pound, fruits, fresh vegetables, and spices together $1.00. Make out the grocery bill and find its amount.

2. The same family buys at the meat market in one week: 2 pounds of beefsteak on Monday at 15¢ a pound, a 6-pound lamb roast on Tuesday at 18¢ a pound, 2 pounds of pork-chops on Thursday at 12¢ a pound, a 5-pound trout on Friday at 10¢ a pound, and a 4-pound chicken on Saturday at 14¢ a pound. Make out the meat bill and find the amount.

3. This family buys at the dry-goods store in one week: 4 yd. of toweling at 20¢ a yd., 12 yd. of calico at 6¢ a yd., 6 yd. of cotton cloth at 10¢ a yd., and notions 50¢. Find the amount of the dry-goods bill.

4. This family paid in one week for rent $4, for fuel $2, for lighting 50¢, for clothing $4, and for incidentals $2. Find the total expenses of this family for a week.

5. The income of this family is $30 per week. How many dollars has this family left after paying all expenses for one week?

6. At this rate how many dollars can they save in one month? In one year?

7. How many years would it take them to pay for a home costing $2,280?

Four girls, Sarah, Julia, Anna, and Frances, made articles for a charity sale.

1. Sarah made 2 sofa pillows. She used $\frac{3}{4}$ of a yard of linen for each costing 40¢ a yard, 6 skeins of embroidery silk for each at 4¢ a skein, $2\frac{1}{4}$ yards of cord for each at 50¢ a yard, and paid 10¢ for stamping each. What did the materials cost?

2. Julia made 4 raffia baskets, the material for each costing 12¢. How much did the material cost?

3. Anna bought 1 sq. yd. of linen and made it into handkerchiefs, using a piece 12 in. square for each. The linen cost $1.25 and the thread 5¢. How many handkerchiefs did she make? What did the materials cost?

4. Frances made 3 aprons. She used $1\frac{1}{4}$ yards of muslin for each at 16¢ a yard and 2 spools of thread at 5¢ a spool. How much did the materials cost?

5. The girls bought materials and together made a dress. They used 6 yd. of dimity at 15¢ a yard, 1 dozen buttons for 10¢, 2 spools of thread at 5¢ a spool, 5 yd. of lace at 12¢ a yard, 3 yd. of insertion at 10¢ a yard. What did the materials cost?

6. They also bought materials and made a coat: 3 yards of cloth at $1.00 a yard, $\frac{3}{4}$ of a yard of velvet at $1.20 a yard, 3 yards of lining at 30¢ a yard, 8 buttons at 6¢ apiece, sewing-silk and thread for 20¢. What was the cost of the materials?

7. The pillows sold for $2.25 each, the baskets for 50¢ each, the aprons for 40¢ each, the dress for $4.50, and the coat for $9.75. What was the total?

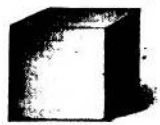


Fig. 1

Fig. 2

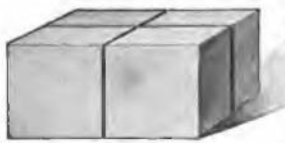


Fig. 3

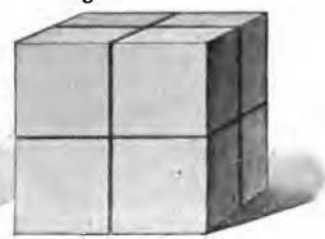


Fig. 4

1. If Figure 2 represents 2 1-inch cubes, how many 1-inch cubes does Figure 3 represent? How many blocks like Figure 3 are required to make one like Figure 4?

2. How many 1-inch cubes in Figure 2? In Figure 3? In Figure 4?

3. What are the length, breadth, and thickness of Figure 2? How many cubic inches in Figure 2?

2×1 cubic inch (cu. in.) = — cu. in.

4. What are the length, breadth, and thickness of Figure 3? How many cubic inches in Figure 3?

$2 \times 2 \times 1$ cu. in. = — cu. in.

5. What are the length, breadth, and thickness of Figure 4? How many cu. in. are there in Figure 4?

$2 \times 2 \times 2 \times 1$ cu. in. = — cu. in.

6. How does the **product of the three numbers** representing the **length, breadth,** and **thickness** compare with the **number of units of volume?**

1. If the basket in the picture is 10 in. by 18 in. at the bottom and 24 in. high, it holds 20 cu. in. more than 2 bushels. How many cubic inches in a bushel?

2. How many cubic inches are there in the contents of a box 3 in. long, 2 in. high, and 2 in. wide?

3. How many 1-inch cubes are necessary to make a solid 9 inches long, 3 inches wide, and 4 inches high?

4. Walter has 100 1-inch cubes. When piled in a solid 10 in. long and 5 in. wide, how high is the solid?

5. How many 2-inch cubes in a block 4 inches by 6 inches by 8 inches?

6. A cube 1 foot on an edge contains — cu. in.

7. A grain-bin is 12 feet long, 10 feet wide, and 8 feet deep; how many cubic feet does it hold?

8. How many square feet of boards are there in the 4 sides of the bin mentioned in Exercise 7?

9. How many feet of boards 1 ft. wide will be needed to make a box 4 ft. long, 2 ft. wide, and 2 ft. high?

10. If the nails cost 10 cents, the labor of making 25¢, and the lumber costs at the rate of 1¢ per square foot, what is the cost of making the box in Exercise 9?

Find the volumes of these blocks:

	11.	12.	13.	14.	15.
Length,	6 in.	34 in.	67 in.	30 in.	15 ft.
Breadth,	8 "	5 "	32 "	4 "	5 "
Thickness,	3 "	20 "	2 "	5 "	7 "

1. Cut a piece of paper 3 inches by 4 inches, as shown in the figure. Fold according to the creases. Mucilage the extra margins at the bottom and on the side pieces. Bend the sides up until they meet, then close the top. Press the mucilaged parts upon the adjacent faces. What kind of a form is made?

2. How many 1-inch cubes does it take to make 3 layers of cubes on a rectangle 6 inches wide and 7 inches long?

3. How many 1-inch cubes does it take to fill a rectangular box 4 in. deep, 7 in. wide, and 10 in. high?

4. How many 1-inch cubes does it take to fill a rectangular box 4 in. by 7 in. by 10 in.?

5. How many 1-inch cubes does it take to make a pile 6 inches long, 4 inches wide, and 5 inches high?

6. If the cubes of the previous exercise were painted black at first, and if the outside surface of the pile is painted red, how many cubes have no red paint? How many are painted red on one side? On two sides? On three sides?

7. How many glass paper-weights in the form of 3-inch cubes can be packed into a case 12 inches deep, 15 inches wide, and 24 inches long?

1. The picture shows a clay model on a base 12 inches square. The figure is a square 6 inches on a side; what area does the model cover? What is the area of the whole base? What is the area of the base not covered?

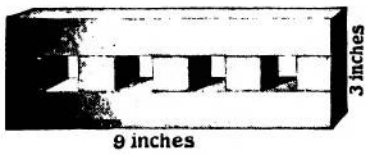
2. 36 is what part of 144? The area covered by the figure is what part of the area of the base?

3. If you model a 4-inch square on a base 8 inches square, what part of the base is not covered?

4. If you model a cube 3 in. on an edge, how many cubic inches of clay do you use?

5. If you make a column 2 in. square at the ends and 10 in. long, how many cu. in. of clay in it?

6. A clay tablet is 6 in. long, 8 in. wide, and $1\frac{1}{2}$ in. thick; how many cubic inches of clay does it contain?



7. The clay blocks shown in the picture are all 1 inch square at the ends. How many cubic inches of clay were used in the model?

8. How long is a clay column whose cross-section is 1 sq. in., and whose volume is 16 cubic inches?

9. If the column of Exercise 8 stands on a square base, 8 in. on a side, and 2 in. thick, how many cubic inches of clay in the model?

1. 2 cu. ft. of water weigh 125 lb. How many cu. ft. are there in the volume of a tank 2 ft. by 4 ft. by 7 ft. How many lb. of water will the tank hold?

2. Stone of a certain variety weighs three times as much as an equal bulk of water. Find the weight of a block of this stone 4 feet square and 1 foot thick; 4 feet square and 4 feet thick.

3. Elm weighs $\frac{4}{5}$ as much as water. Find the weight of a beam of elm 1 foot square and 12 feet long.

4. Cork weighs $\frac{1}{4}$ as much as water. Find the weight of 4 cubic feet of cork.

5. Alcohol weighs $\frac{8}{10}$ as much as water. Find the weight of a cubic foot of alcohol.

6. According to Exercise 5, what is the weight of enough alcohol to fill a tank 2 ft. by 4 ft. by 5 ft.?

7. Steel is 8 times as heavy as water. Find the weight of a steel bar 6 inches square and 10 feet long.

8. A cubic foot of sulphur weighs 125 lb. Sulphur is how many times as heavy as water per volume?

9. Nickel is 9 times as heavy as water. What is the weight of 4 cubic feet of nickel?

10. Ice is $\frac{9}{10}$ as heavy as water. How many pounds do 2 cubic feet of ice weigh?

11. What is the weight of a load of ice that fills a box 3 ft. by 2 ft. by 14 ft.?

12. How many cubic feet of cork will weigh as much as 2 cubic feet of water?

13. What is the weight of a rectangular block of ice 12 feet square and 1 foot thick?

GENERAL REVIEW

1.

$5 \times 6 = —.$
$8 \times 9 = —.$
$6 \times 7 = —.$
$8 \times 4 = —.$
$8 \times 6 = —.$
$9 \times 4 = —.$
$8 \times 7 = —.$
$9 \times 7 = —.$
$10 \times 8 = —.$

2.

$7 \times 9 = —.$
$5 \times 7 = —.$
$6 \times 8 = —.$
$9 \times 5 = —.$
$7 \times 4 = —.$
$9 \times 6 = —.$
$10 \times 7 = —.$
$7 \times 8 = —.$
$9 \times 8 = —.$

3.

$8 \times 8 = —.$
$8 \times 5 = —.$
$6 \times 9 = —.$
$7 \times 7 = —.$
$6 \times 4 = —.$
$9 \times 9 = —.$
$7 \times 6 = —.$
$10 \times 9 = —.$
$10 \times 10 = —.$

4.

$63 \div 9 = —.$
$48 \div 8 = —.$
$54 \div 9 = —.$
$49 \div 7 = —.$
$54 \div 6 = —.$
$81 \div 9 = —.$
$72 \div 8 = —.$
$56 \div 7 = —.$
$90 \div 9 = —.$
$64 \div 8 = —.$

5.

$\frac{1}{6}$ of $54 = —.$
$\frac{1}{9}$ of $63 = —.$
$\frac{1}{7}$ of $42 = —.$
$\frac{1}{9}$ of $54 = —.$
$\frac{1}{5}$ of $45 = —.$
$\frac{1}{9}$ of $81 = —.$
$\frac{1}{7}$ of $56 = —.$
$\frac{1}{7}$ of $63 = —.$
$\frac{1}{5}$ of $35 = —.$
$\frac{1}{9}$ of $72 = —.$

6.

$\frac{1}{7}$ of $49 = —.$
$\frac{1}{6}$ of $30 = —.$
$\frac{1}{8}$ of $48 = —.$
$\frac{1}{6}$ of $42 = —.$
$\frac{1}{4}$ of $36 = —.$
$\frac{1}{10}$ of $70 = —.$
$\frac{1}{7}$ of $42 = —.$
$\frac{1}{8}$ of $56 = —.$
$\frac{1}{10}$ of $90 = —.$
$\frac{1}{8}$ of $40 = —.$

7.

$\frac{2}{3}$ of $21 = —.$
$\frac{4}{5}$ of $45 = —.$
$\frac{3}{7}$ of $42 = —.$
$\frac{5}{6}$ of $36 = —.$
$\frac{7}{8}$ of $72 = —.$
$\frac{3}{10}$ of $40 = —.$

8.

$\frac{3}{5}$ of $35 = —.$
$\frac{2}{9}$ of $81 = —.$
$\frac{6}{7}$ of $63 = —.$
$\frac{5}{8}$ of $32 = —.$
$\frac{5}{9}$ of $45 = —.$
$\frac{7}{10}$ of $70 = —.$

9.

$\frac{2}{7}$ of $56 = —.$
$\frac{7}{8}$ of $40 = —.$
$\frac{3}{8}$ of $64 = —.$
$\frac{7}{9}$ of $54 = —.$
$\frac{4}{7}$ of $56 = —.$
$\frac{8}{9}$ of $72 = —.$

Add:

1. 78 45 12 76	2. 87 67 15 45	3. 25 94 75 66	4. 89 45 92 12
5. 15 86 57 52	6. 70 88 49 77	7. 70 42 73 25	8. 70 49 29 58

Subtract:

9. 644 599	10. 897 543	11. 420 279	12. 525 398
13. 965 547	14. 328 322	15. 654 648	16. 159 84
17. 899 674	18. 994 758	19. 259 245	20. 855 700

Add:

21. $987 777 234 815 $	22. $675 235 408 359 $	23. $795 679 385 777 $	24. $423 200 110 432 $
25. $667 425 885 333 $	26. $769 889 226 785 $	27. $889 334 114 669 $	28. $646 225 798 443 $

1. $8000 \div 6 = —$.
2. $6899 \div 3 = —$.
3. $5060 \div 53 = —$.
4. $8965 \div 35 = —$.
5. $7965 \div 15 = —$.
6. $5400 \div 25 = —$.
7. $7653 \div 29 = —$.
8. $9854 \div 42 = —$.
9. $50 \times 99 = —$.
10. $34 \times 57 = —$.
11. $48 \times 76 = —$.
12. $42 \times 99 = —$.
13. $80 \times 90 = —$.
14. $30 \times 89 = —$.
15. $78 \times \$34 = —$.
16. $92 \times \$99 = —$.
17. $\frac{2}{5}$ of $725 = —$.
18. $\frac{2}{3}$ of $261 = —$.
19. $\frac{4}{5}$ of $985 = —$.
20. $\frac{3}{7}$ of $434 = —$.
21. $\frac{5}{6}$ of $636 = —$.
22. $\frac{7}{8}$ of $\$876 = —$.
23. $\frac{3}{4}$ of $\$208 = —$.
24. $\frac{3}{5}$ of $\$985 = —$.

Add:

25. $36.50 11.38	26. $46.23 37.65	27. $78.99 12.96	28. $20.70 15.55
29. $65.90 33.22	30. $70.99 19.64	31. $85.66 24.25	32. $28.75 24.50

Subtract:

33. $75.40 30.16	34. $88.90 64.52	35. $64.40 25.50	36. $84.95 67.97

Find the number for which x *stands:*

Thus, in the thirty-seventh:
$277 - 7 = 270$, and $270 \div 15 = 18$, the quotient, or x.

	Dividend	Quotient	Divisor	Remainder
37.	277	x	15	7
38.	1652	18	x	14
39.	x	32	16	4

1. Rule a table like the following and replace the question-marks by the required fractions. Thus, the first question-mark in the top row stands for $\frac{2}{4}$, since $\frac{1}{2}=\frac{2}{4}$; and the first question-mark in the second row stands for $\frac{2}{6}$, since $\frac{1}{3}=\frac{2}{6}$.

	4ths	6ths	8ths	9ths	10ths	12ths	14ths	15ths	16ths	18ths
$\frac{1}{2}=$	?	?	?		?	?	?		?	?
$\frac{1}{3}=$		?				?				?
$\frac{1}{4}=$			?						?	
$\frac{1}{5}=$					?					
$\frac{1}{6}=$						?				?
$\frac{1}{7}=$							?			
$\frac{1}{8}=$									?	
$\frac{1}{9}=$										?

2. What would the second line read if $\frac{1}{3}$ be replaced by $\frac{2}{3}$? The third line, if $\frac{1}{4}$ is replaced by $\frac{3}{4}$? Make and solve 5 other problems.

3. What does it cost at 2¢ a mile to ride from Buffalo to New York, a distance of 440 miles?

Find the price per dozen if :

1. 37 dozen bars of soap cost $18.50.

2. 1 gross of canned corn cost $36.72.

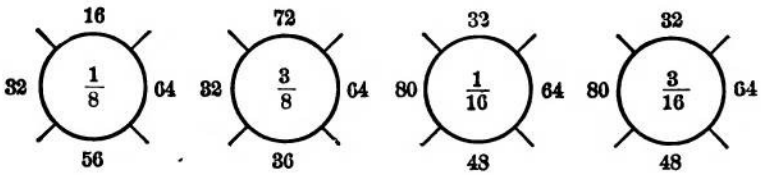
3. 11 dozen water-glasses cost $23.32.

4. 12 dozen cans of baking-powder cost $43.20.

5. Find the area of a rectangle whose base is 15 inches and whose altitude is 7 inches.

6. In 1902 there were 25 Government schools for Indians with an attendance of 6,900; what was the rate of attendance per school?

7. Name the part of each number on the outside of the circle shown by the fraction within the circle:



8. The usual annual yield of a cork-tree is 45 pounds; at this rate what will be the yield of a tree whose lifetime is 150 years?

9. The new East River bridge is 9,335 feet long; this is how many feet more than a mile (5,280 ft.)?

10. The bridge has a carriage-way 38 ft. wide, 4 trolley-beds each 15 ft. wide, and 2 footways each 11 ft. wide; how many feet wide is the bridge?

11. A troop of cavalry contains 18 officers, 8 workmen, and 43 privates; what is the total number in a troop?

1. How far will a bicycle wheel 8 feet around travel in making 125 revolutions?

2. A horse that travels 1 mile in 6 minutes goes how far in 1 hour?

3. $\frac{1}{2}$ of a 72-foot flagstaff was broken off; how many feet were left standing?

4. A school-ground containing 4,880 square feet is 80 feet wide; how long is it?

5. There are in a house 2 rooms 9 ft. by 12 ft., 3 rooms 15 ft. by 18 ft., 1 room 15 ft. by 21 ft., and 4 rooms 12 ft. by 15 ft. What is the area of the floor surface?

6. What is the cost of lathing the side-walls and ceiling of a room 15 feet by 12 feet and 9 feet high at 10¢ a square yard?

7. What will it cost to plaster the same room at 25¢ per yard, not allowing for windows or doors?

8. How many sheep will it take to produce a ton of wool at the rate of 5 pounds each?

9. A farmer has an orchard of 500 trees which bear at the rate of 2 barrels of apples per tree. If he gets $3 per barrel for the fruit, how much does the crop bring?

10. Robert deposited in the savings-bank $1.25 in January, $2.30 in February, $1.70 in March, $4.35 in April, and $3.25 for each of the other months of the year; how much did he deposit during the year?

11. He drew from the bank $5 for books, $10 for clothes, and $6 for incidentals during the year; how much had he left in the bank?

1. Lay two objects on the floor 5 yards apart as nearly as you can judge. Then measure the distance and correct your estimate.

2. Lay two objects 7 feet apart as nearly as you can judge, and test the result by measuring the distance. Repeat for distances of 3 ft.; 9 ft.; 6 ft.; 8 ft.

3. Draw a rectangle 1 foot wide that has an area of $1\frac{3}{4}$ square feet; an area of $2\frac{2}{3}$ square feet.

4. Draw a rectangle 1 yard long that has an area of $\frac{2}{3}$ of a square yard; an area of $\frac{3}{4}$ of a square yard; an area of $\frac{1}{4}$ of a square yard.

5. If a line 1 inch long on a map represents 1,000 miles, how many inches represent 3,500 miles?

6. The owner of a building contracted with a coal merchant to supply him with 20 tons of coal per month for 6 months at \$7.20 per ton. The market price of coal during these months was \$6.50, \$7.00, \$7.60, \$7.40, \$6.00, \$5.80. Did the owner of the building gain or lose by his contract, and how much?

Make bills for the following, with yourself as purchaser and some firm that you know as seller:

7. January 17, 3 yards of flannel at 75¢; 6 yards of flannel at 68¢; 2 yards of flannel at \$1.12.

8. July 3, 11 yards of red bunting at 18¢ per yard; 14 yards of blue bunting at 17¢ per yard; 21 yards of white bunting at 19¢ per yard.

9. October 14, 14 feet of picture-molding at 4¢ per foot; 3 dozen picture-hooks at 5¢ per dozen; 2 dozen fancy knobs at 13¢ each.

Make the bills and find the amount of each :

1. Charles Ward bought of Richard White:

225 ft. tile at \$.04.
10 barrels lime at \$3.25.
3 tons soft coal at \$4.00.

2. Anna Spencer bought of Charles Martin and Co.:

5 yd. silk at \$1.75.
$\frac{1}{4}$ yd. lace at \$5.00.
6 spools silk at 10¢.

3. Mary Matthews bought of H. C. Taylor and Co. 6 books at \$1.75, 4 tablets at 15¢, 20 pencils at $2\frac{1}{2}$¢, and 3 packages of writing-paper at 25¢ a package.

4. Stephen Miles sold to Thomas Stearns 40 bu. of rye at \$.75 a bu., 10 bu. of oats at 50¢ a bu., and 100 bu. of wheat at 65¢ a bu.

5. Edward Riley bought of a publisher 7 Latin grammars at \$1.65 each, 3 arithmetics at \$.95 each, and 9 geographies at \$.75 each.

6. Mrs. George Sampson bought of Marshall Field and Co., 10 yd. of dimity at 25¢ a yard, 3 yd. of silk at 75¢ a yd., 6 pairs of curtains at \$7.50 a pair, and 20 yd. of matting at 45¢ a yard.

7. Mrs. T. C. Jones bought of William Miller 5 lb. of butter at 25¢ a lb., 6 cans of corn at 10¢ a can, 20 lb. of sugar at 6¢ a lb.

Show by paper folding that :

8. $\frac{1}{2}$ of $\frac{1}{8} = \frac{1}{16}$. 9. $\frac{1}{3}$ of $\frac{1}{3} = \frac{1}{9}$. 10. $\frac{1}{4}$ of $\frac{1}{3} = \frac{1}{12}$.

11. $\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$. 12. $\frac{1}{5} - \frac{1}{10} = \frac{1}{10}$. 13. $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$.

1. What unit may one use to measure the length of a pencil? The width of a page of this book?

2. What unit may one use to measure the length of a room? The height of a building? The length of a village block? The distance to a neighboring city?

3. For what are the inch, foot, and yard used?

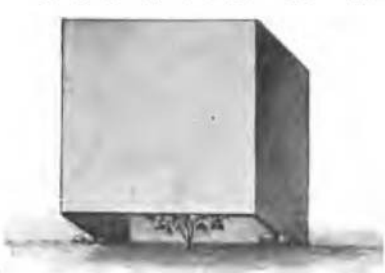
4. What unit may one use to measure the surface of a page of this book? The surface of a floor? The surface of a lawn? Of the street?

5. For what are the square inch, square foot, square yard, and square mile used? Units for measuring surface are called what kind of units?

6. What units are used to measure volume? How do the length, breadth, and thickness of a cube compare?

7. What is the area of the entire surface of a cube, each of whose edges is 4 inches long?

8. Plants are sometimes covered to protect them from the sun or frost by a cubical cover 1 foot each way. How many square feet of material are needed to make one cover, allowing 1 sq. ft. for the lapping of the corners?



9. How many such covers can be made from 72 square feet of paper? From 48 square feet? From 36 square feet?

1. How many cubic feet are there in a vat 12 feet long, 6 feet wide, and 4 feet deep? What is the cost of lining its sides and bottom with tin at 6 cents per square foot?

2. What is the cost of excavating a cellar 8 yd. wide, 14 yd. long, and 2 yd. deep at $1 per cubic yard?

3. If the drawer in the picture is 4 in. wide, 4 in. deep, and 16 in. long, how many 1-inch cubes will it hold? How many 2-inch cubes? 4-inch cubes?

4. Some beavers built a dam 50 yards long; how many feet long was it? How many times the length of your schoolroom would this be?

5. How many steel rails 33 feet long are there in a mile of railroad-track?

6. America built 6,000 miles of railroad in 1902; how many miles per month was this?

7. Two trains going in opposite directions leave Chicago at the same time, each going 35 miles an hour; how far apart are they in 2 hours? In 4 hours? In 10 hours?

8. Make a drawing for Exercise 7 to show the positions of the trains relative to Chicago for each number of hours. What length is used to represent 35 mi.?

9. If two trains leave Buffalo at the same time and travel in the same direction, one at the rate of 45 mi. an hour, and the other at the rate of 30 mi. an hour, how far apart are they at the end of 2 hr.? 4 hr.? 10 hr.?

DENOMINATE NUMBERS

Tables

Linear

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (1 yd.)
1760 yards (yd.) = 1 mile (mi.)
5280 feet = 1 mile

Time

60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
365 days or
12 months (mo.) = 1 year (yr.)

Liquid

2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

Counting

12 units = 1 dozen (doz.)
12 dozen = 1 gross

Dry

2 pints (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds (lb.) = 1 hundredweight
2000 pounds = 1 ton (t.)

Value

10 cents (¢) = 1 dime
10 dimes = 1 dollar
100 cents = 1 dollar ($)

Square

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)

Cubic

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)

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